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ABSTRACT

This final report describes an effective, computer-based method of communicating new syntactic knowledge to students with deafness. "Choosing AVMs," the first intervention developed on the Macintosh computer, used advanced visual markers (AVMs) (icons) to communicate the essence of the syntactical structure to be taught by: (1) capturing facial expressions that are used as linguistic markers in American Sign Language; (2) utilizing international symbols; and (3) employing other visual devices to communicate syntactic information to deaf learners who do not have the reading comprehension skills necessary to rely solely on textual clues and information. "The Yes-No Game," the second computerized intervention developed, also utilized the high resolution graphics capability of the Macintosh to achieve the visual effects essential to the instructional approach, but it emphasized visual clues other than advanced visual marker icons. Written and graphic corrective feedback responded specifically to each error that students made in building English questions, and enabled them to correct their misunderstandings. With accompanying pictures to aid comprehension, and with multiple opportunities to practice and to receive immediate visual feedback, students with deafness were able to overcome their difficulties in building yes-no questions in English. Appendices include sample screens from the programs. (Contains 46 references.) (Author/CR)

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The AVM Project: Final Report

The Use of Advance Visual Markers (AVMs) to Teach English Syntax to the Deaf

Nancy S. Fogel
Project Director

October, 1989

U.S. DEPARTMENT OF EDUCATION
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ABSTRACT

The formidable difficulties that deaf students experience in learning English are reflected in the large number of functionally illiterate deaf adults. Instructional methods to date have not effectively developed the ability of the Deaf to read and write English sufficiently. As a result, the majority of deaf adults remain undereducated, underemployed, and limited in their ability to participate fully in our society. Building on the visual orientation of the Deaf, and employing such American Sign Language (ASL) techniques as visualization and directionality, we designed an effective computer-based method of communicating new syntactic knowledge to deaf students.

Choosing AVMs, the first intervention developed on the Macintosh computer, allowed us to evaluate the effectiveness of using Advanced Visual Markers (icons) to communicate the essence of the syntactical structures to be taught by (1) capturing facial expressions that are used as linguistic markers in ASL, (2) utilizing international symbols, and (3) employing other visual devices to communicate syntactic information to deaf learners who do not yet have the reading comprehension skills necessary to rely solely on textual clues and information. *The Yes-No Game*, the second computerized intervention we developed, also utilized the high resolution graphics capability of the Macintosh to achieve the visual effects essential to our instructional approach, but it emphasized visual clues other than AVM icons. Written and graphic corrective feedback responded specifically to each error that students made in building English questions, and enabled them to correct their misunderstandings. With accompanying pictures to aid comprehension, and with multiple opportunities to practice and to receive immediate visual feedback, we provided the instructional foundation and methodology to enable deaf students to overcome their difficulties in building yes-no questions in English.

Tests of high reliability were constructed to measure the efficiency of the *Yes-No* computer-based materials in teaching specific English syntax skills. These tests consisted of two parts: Part I, in a multiple choice format, measured the students' recognition of correct grammatical structures, and Part II elicited actual sentence production. Developed in several forms, the tests were administered in a pre- post test evaluation. With minor exceptions, as described fully in the report, these tests show substantial and rapid improvement in areas of syntax in which progress with conventional materials in the classroom is at best extremely slow .

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Introduction: A Description of the Research Problem

An effective comprehensive program of instruction for deaf students in basic English reading and writing skills has yet to be developed. To date, only 10% of the best 18 year-olds read at or above the eighth grade level, and the average deaf adult reaches only a fourth grade reading level (Quigley, 1984). As a result, large numbers of deaf adults remain functionally illiterate.

Although the deaf have been disadvantaged by their handicap, developments in research and practice suggest a promising future. The revolution in linguistic thinking which began in the sixties has extended to studies of language and communication of the Deaf. The pioneering work of William Stokoe (1960) followed by Bellugi (1972), Newport (1977), Siple (1978), and Lane and Grojean (1980), firmly established American Sign Language (ASL) as a "natural" language. Where English is a natural aural-oral language,[1] ASL is a natural visual-gestural language[2] that has evolved to meet the specific communication needs of the Deaf. Using highly visual information processing and storage techniques, the Deaf acquire linguistic structures with facility in ASL; yet, they experience great difficulty learning comparable structures in English.

With the availability of new computer technology for instruction, many of the obstacles to effective English syntax instruction for the Deaf may be removed. The potential of computers to build highly visually-oriented materials can capitalize on the visual-gestural grammar inherent in ASL and expose deaf students to the rich English language environment that their hearing peers experience daily. Hearing children enter school with a fairly complete knowledge of the syntax and lexicon of the English language; they learn to map the written word onto what they know "sounds right." In contrast, deaf students who have never heard English are expected to replicate the lexicon and syntax; they must learn how to read and write an auditorally based language without access to the spoken word.

Microcomputer-based language programs, however, can offer a way to build upon the prior language-related, visual knowledge that the Deaf acquire in learning sign language. Where most English instruction relies on the linear sequencing of the language, computer-assisted instruction (CAI) can add the ASL dimensions of position and motion in space to enhance English language learning; as a result, educational software can offer hearing-impaired students more rewarding opportunities for interactive language experience than they usually encounter. Utilizing visualization and simultaneity of expression, which the Deaf use so effectively in ASL communication, CAI can employ graphics, windows, and reverse video to highlight and emphasize instructional points and corrective feedback. Through CAI designed specifically for the hearing-impaired, students can be motivated to interact with an instructional environment in which the syntax, vocabulary, and figurative language are linguistically controlled and incrementally graduated in difficulty. English language acquisition and usage can proceed at the learner's own pace, but more rapidly than previously experienced by deaf students.

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[1] Aural-oral indicates that language is received auditorally and transmitted through speech.

[2] Visual-gestural indicates that language is received visually and transmitted through signs and gestures.

As stated in Toward Equality: Education of the Deaf (the report of the Commission established by Public Law 99-371 in August of 1986 to study, evaluate, and make recommendations on the quality of education of the Deaf), facilitating English language acquisition, as well as supporting the technological application of new research in the linguistic processing of deaf children, should be top priorities in federally funded research (Commission, 1988). Recognizing the needs of deaf children and young adults, the Office of Special Education Programs (OSEP) granted two-year support to the American Institutes for Research (AIR) to investigate the efficacy of using highly visually-oriented techniques, such as Advanced Visual Markers (AVMs), in CAI designed to teach English syntax to hearing-impaired high school students.

Project Objectives: Goals

In order to ascertain the effectiveness of highly visually-oriented CAI, which employed such devices as AVMs (icons) to teach syntax skills to deaf students, we established four project objectives:

1. To design and develop maximally effective treatment materials through consultation with members of our expert advisory panel, and evaluation by hearing-impaired individuals
2. To effectively plan and control the logistics of screening and treatments so that pre-testing, treatment administration, and post-testing would proceed efficiently and yield valid and reliable data
3. To analyze pre- to post-test gains in order to assess the effectiveness of the treatments
4. To disseminate the outcomes of the project to research and practitioner communities

Chronology of Activities: Methodological Approach

The research plan for the AVM Project involved an iterative process of design, consultation with the expert advisory panel, development, testing, treatment, analysis, and dissemination. The soundness of that process was apparent as the project director, Nancy S. Fogel, reevaluated the plan when she joined AIR to conduct the AVM Project. However, the rapid technological advances in the year between submission and funding demanded a comprehensive study of authoring systems and computers, as well as a review of the literature in the areas of computer-assisted language learning (CALL), language instruction for the Deaf, and English as a Second Language (ESL). In place of the original Apple II delivery system, our investigation led us to the Macintosh computer and its powerful object-oriented programming languages, HyperCard and MacApp, which have strengthened the AVM program. Critical components of the instructional approach — graphics and animation — were handled with facility in these two computer languages.

1. Literature Search and Review

To take advantage of recent knowledge in the areas related to CAI and to the pedagogical approaches to educating the hearing-impaired, we conducted a search of the ERIC and Books in Print databases on Dialog (an on-line information retrieval service); in addition, we personally contacted renowned researchers in these fields. A review of the literature validated the direction of our original proposal. Toward Equality: Education of the Deaf emphasized the Commission's paramount concern with facilitating deaf students' acquisition of English, which they consider to be the "password" that permits entry into society and enables the deaf to achieve equality of opportunity. In addition, the Commission supported the technological application of new research in the linguistic processing of deaf children (Commission, 1988).

Studies in psycholinguistics and cognitive psychology revealed that the Deaf find the acquisition of English syntax to be especially difficult because they rely on visual coding rather than speech coding (Conrad, 1965; Lichtenstein, 1983). Without auditory encoding and decoding, learning the rules of correct word order, which are essential to the comprehension of an English sentence from its beginning to end, becomes a formidable task (Quigley, 1984).

To enable the Deaf to learn English syntax, we explored the "direct instruction" approach. Although the term is associated with a small set of educational researchers, once one allows for differences in the formulation of instructional principles and the labeling of psychological and cognitive constructs, there is a surprising consensus among a wide range of instructional psychologists on a core set of principles of sound instruction:

1. Target instruction at the level which meets the instructional needs of the student — where content has not yet been mastered, but is within reach; mastery at one target level will, in turn, provide the prerequisite knowledge needed to make the next target level accessible (Woodward & Carnine, 1986).

2. Engage learners through motivational and "attention focusing" strategies (Gagne & Briggs, 1977).

3. Guide the learner through models which make clear when and how to apply newly acquired knowledge (Scandura, 1980).

4. Provide learners with ample opportunities to demonstrate their mastery of models in a context that makes errors likely, if the learners have not understood the new content well (Merrill et al., 1977).

5. Provide immediate, accurate, and comprehensible feedback (Brown et al., 1982).

Studies of the "direct instruction" approach with deaf students provided support for our model. Furth and Youniss (1965) found that although deaf adolescents demonstrated an impaired ability to discover complex logical operation principles intuitively, they could be taught to use them. Tests performed on college-bound deaf students revealed that their inferior performance on tasks involving sequential recall could be significantly improved through explicit instruction in information-processing strategies (Belmont et al., 1976). Subsequent studies (Iran-Nejad et al., 1981) demonstrated that even though deaf subjects tended to interpret literally, they were able to counteract that tendency through practice sessions. As Geers concluded from a study of 327 profoundly deaf children from aural-oral and total communication programs, "more emphasis on systematic instruction in English is needed, regardless of the mode of communication used or the philosophy adhered to" (Geers et al., 1984, p.387).

Our review of the literature encouraged the use of CAI with hearing-impaired persons. Currently, deaf education programs utilize more CAI than any other programs for handicapped persons (Thorkildsen, 1985). The computer's capacity for visualization and simultaneity of expression, as well as for immediate feedback, have been posited as the keys to substantially improving English language instruction for the deaf. The computer's special graphic capability can present concepts linked to the visual-gestural knowledge base of the deaf; incorporating graphics as a visualization technique can clarify meaning and enhance comprehension so that learners are not required to rely primarily on textual material.

Current research not only indicates the merit of interactive instruction, as we originally planned, but also validates CAI techniques which provide students with semantically meaningful language environments and with opportunities to initiate communication, rather than environments which only require that learners respond to individual exercise sentences (e.g. Prinz, 1985). As a result of these findings, we strengthened our instructional design by providing more opportunity for students to initiate expressive language.

The literature we reviewed throughout the project was drawn from many different fields: education of the deaf, English language instruction for deaf and second language students, the direct instruction approach (Becker & Engelmann, 1977) and its application to CAI (Engelmann & Carnine, 1982), instructional design for CALL, and linguistic studies of ASL and other communication modes of the Deaf. The literature has been a constant source of new ideas for the AVM project, but writings on CALL for the hearing-impaired are too few to justify a literature review.

2. *Using Articles*: Demonstration CAI Materials

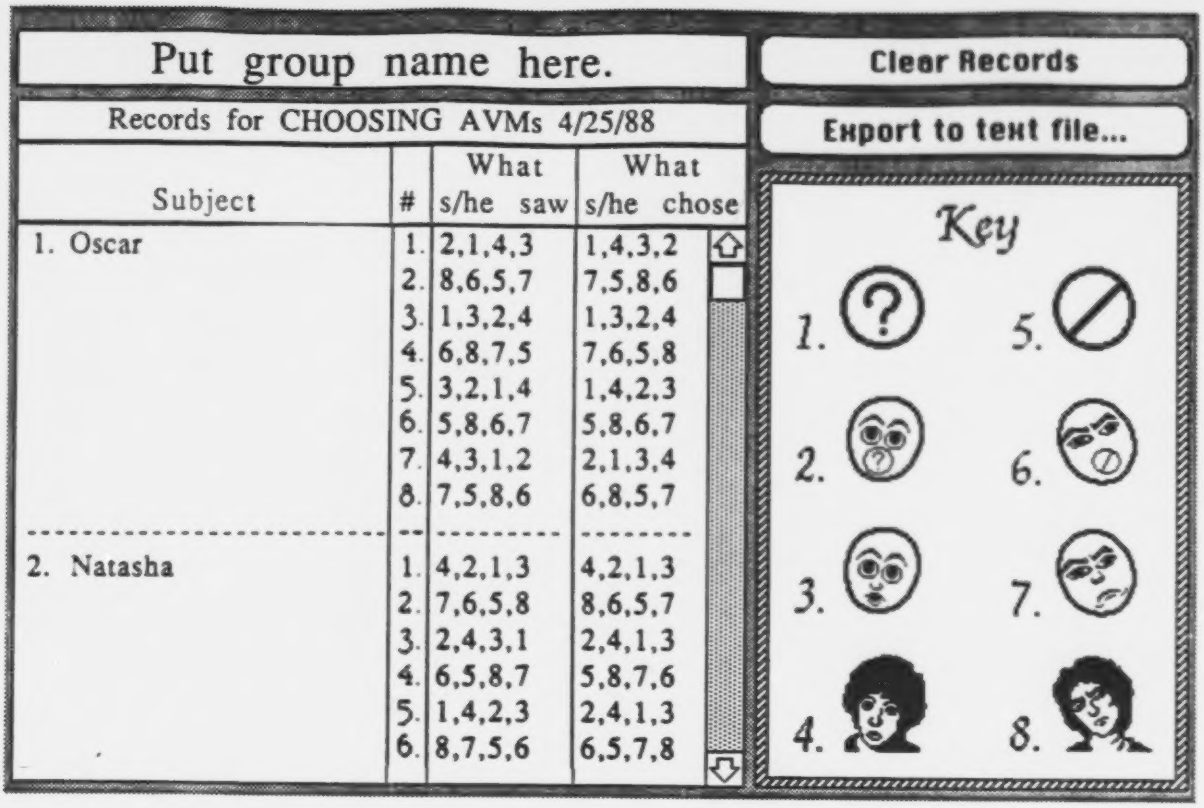
To encourage deaf education programs to participate in our research, we created and demonstrated a Macintosh prototype of CAI-based syntactical instruction for the deaf. The *Using Articles* software, which was based on work undertaken by the project director before the AVM project was initiated, demonstrated the capacity of CAI to compensate for the language deficiency of deaf students by placing them in a highly-visual, linguistically controlled environment which could enable them to overcome a common linguistic difficulty — correctly using the articles *a*, *an*, and *the* with count nouns. (Appendix 2 displays screens of the program.) As a result of their exposure to *Using Articles*, five sites agreed to participate in the research project.

3. *Choosing AVMs:* An Initial Study of CAI Material for the Deaf

In English the grammatical element that distinguishes a declarative sentence from an interrogative or negative one is syntax, i.e., word order; however, in ASL the grammatical signals that indicate sentence type are the signer's facial, eye, and head behaviors. These highly visual, non-manual behaviors are produced concurrently with all the manual ASL signs for the concepts and words in the sentence (Baker, 1980). To capitalize on ASL's visualization and simultaneity of expression in teaching English, we created AVMs to provide learners with a visual clue, or bridge. The AVMs were designed to denote such English language requirements as transforming a sentence to a question by changing the word order — for example, moving the BE verb in the sentence (Sara **is** a ballet dancer) to the front to make a question (**Is** Sara a ballet dancer?).

The first major step in developing instructional materials built around AVMs was to decide upon the optimal style of icon. In designing the AVMs to communicate the essence of the syntactical structures to be taught, we used an iterative process: soliciting suggestions from our expert advisory panel, as well as the population of hearing-impaired students and teachers at the participating sites, developing prototype markers, and requesting evaluative feedback from the advisors, teachers, and students. We designed eight AVMs: four for negation and four for question formation. The AVMs ranged from abstract designs based upon international symbols to line drawings to the digitized photographs of a native ASL signer's facial expressions, which are used as linguistic markers when asking a yes-no question or expressing negation. (See Figure 1.)

Programmed in HyperCard to run on a Macintosh, the *Choosing AVMs* study sought the answers to two basic questions. First, would one AVM emerge as the dominant choice across all student populations? Second, would students choose AVMs which were closely related to their language background? For example, would students with exposure to ASL tend to choose Icons 3 and 4 for interrogation and Icons 7 and 8 for negation because those AVMs were derived from the digitized image of a native ASL signer's facial expressions? In contrast, would the more


Clear Records
Export to text file...
Key
1.
2.
3.
4.
5.
6.
7.
8.

Put group name here.

Records for CHOOSING AVMs 4/25/88

Subject	#	What s/he saw	What s/he chose
1. Oscar	1.	2,1,4,3	1,4,3,2
	2.	8,6,5,7	7,5,8,6
	3.	1,3,2,4	1,3,2,4
	4.	6,8,7,5	7,6,5,8
	5.	3,2,1,4	1,4,2,3
	6.	5,8,6,7	5,8,6,7
	7.	4,3,1,2	2,1,3,4
	8.	7,5,8,6	6,8,5,7
2. Natasha	1.	4,2,1,3	4,2,1,3
	2.	7,6,5,8	8,6,5,7
	3.	2,4,3,1	2,4,1,3
	4.	6,5,8,7	5,8,7,6
	5.	1,4,2,3	2,4,1,3
	6.	8,7,5,6	6,5,7,8

Figure 1. AVM Data Collection Screen

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aural-oral, mainstreamed students select the universal textbook symbols in Icons 1 and 2 for interrogation, and Icons 5 and 6 for negation?

Sample

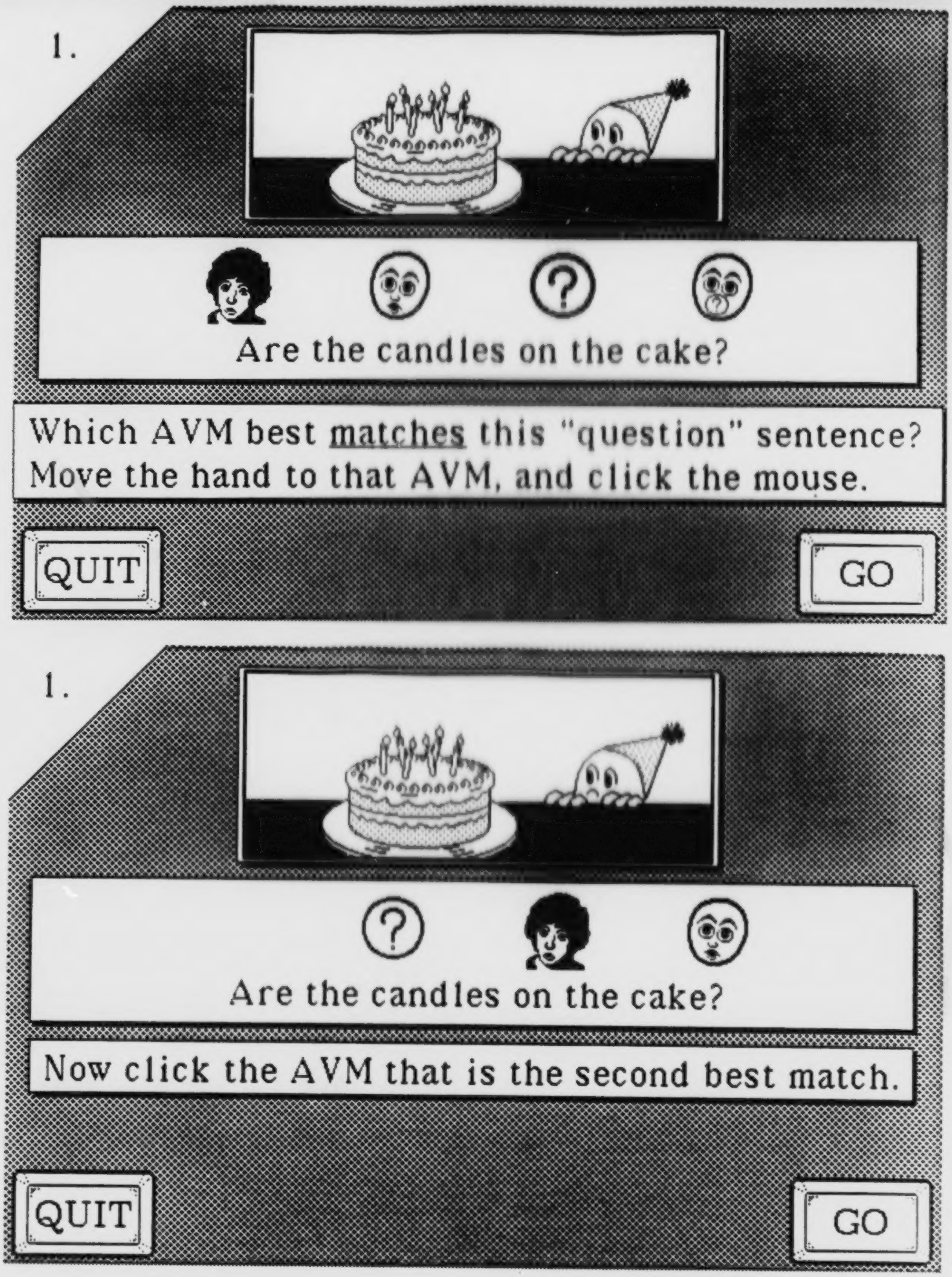
The sample for *Choosing AVMs* was drawn from four secondary school, hearing-impaired populations to determine whether or not there were differences in the rankings of the icons by students with different, primary modes of communication:

1. Twelve "Oral-only" students, ages 14 to 18, were in a day program for the communicatively handicapped at Gunn High School. Oral-only indicates that the students' first language is English, and that they communicate in an aural-oral mode.
2. Twenty-five "Total Communication" students, ages 14 to 19, used SEE II and PSE with speech in a day program at Leigh High School. SEE II, Signing Exact English, is a type of Manually-Coded English (MCE); PSE, Pidgin-Signed English, is a composite of English and sign language.
3. Thirteen "Total Communication" students, ages 14 to 19, used SEE II, PSE, some ASL, and speech in a day program at Capuchino High School.
4. Twenty-one "Total Communication" students, ages 14 to 19, used PSE and ASL with some speech in a residential program at the California School for the Deaf in Fremont (CSDF).

Methodology

To collect data on *Choosing AVMs*, 71 students indicated their preferences for the AVMs currently under consideration. At each of the four test sites, the goals of the program were explained and the students' support was elicited. The students controlled the pace as they proceeded individually through *Choosing AVMs* . (Appendix 3 fully displays the *Choosing AVMs* program.) Following several interactive screens that explained the Macintosh interface, *Choosing AVMs* displayed eight sentence-picture combinations; four questions alternated with four negative sentences. While a sentence-picture combination was displayed, each of the four appropriate AVMs moved individually from left-to-right above the sentence — to replicate the constant presence of the native ASL signer's facial expression during the signing of a question or negative sentence.

After each sentence-picture-AVM display, the students were asked to rank the four AVMs according to the following criterion: which AVM best captured the essence of interrogation — or negation — for that sentence-picture? (Figure 2 displays the program's presentation and ranking process of AVM icons.) The presentation order of the AVMs was randomized, but the AVMs were not presented as a continuum from the most abstract Icon #1, to the most concrete Icon #4 (i.e., the presentation order was never # 1, 2, 3, 4) or vice versa. Figure 1 displays the data that were collected on the presentation order and the ranked responses.



1.

Are the candles on the cake?

Which AVM best matches this "question" sentence? Move the hand to that AVM, and click the mouse.

1.

Are the candles on the cake?

Now click the AVM that is the second best match.

Figure 2. *Choosing AVMS* — Presentation and Ranking of AVMs

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Results

Figures 3 and 4 show the percentage rankings of the students' choices of interrogative and negative AVMs respectively. The solid black bars on the interrogative histograms in Figure 3 indicate a statistically significant preference for Icon 1 — the most abstract AVM — for all schools except CSDF. A plausible explanation for the difference in preference between students at CSDF and the other three sites is that the students at CSDF are exposed to and use sign language as a primary mode of communication. Because facial expressions tend to be incorporated as key syntactical elements in sign language, the AVMs derived from ASL facial expressions are likely to be more familiar to these learners.

In contrast, because students at the other three sites have been mainstreamed for a number of years, their language experiences tend to resemble those of hearing populations. As a result, their AVM preferences would be more closely related to the abstract punctuation symbols more familiar to learners sharing conventional, English language instruction. Students at Leigh and Capuchino, the total communication schools represented by the middle histograms, know SEE II (Signing Exact English) and have recently begun to study ASL; both schools show more of a preference for the concrete Icon 4 than does Gunn (the aural-oral school) and more of a preference for the abstract Icon 1 than CSDF. Therefore, the schools' ranking of the AVMs are ordered from concrete to abstract, reflecting their language orientation, ASL to English.

Of particular note is the pattern of responses displayed in Figure 3. While Gunn students show a progressively decreasing interest in icons along the abstract to concrete continuum, with only 23% choosing interrogative Icons 3 and 4, the CSDF students display a strong interest in the more concrete ASL-like representations; 64% selected Icons 3 and 4. Again, this preference is likely a reflection of the CSDF students' visual mode of learning and exposure to ASL. As a result, their preferences for Icons 3 and 4, the line drawing and the digitized photographic image of a native ASL signer using the facial expression for a yes-no question, are quite understandable. In contrast, the Gunn students' primary mode of communication is aural-oral English, with little or no exposure to ASL.

The responses displayed in Figure 4, the Icon Preferences for Negative Sentences, show a pattern similar to the interrogative ones in Figure 3, but the effect of the negative AVMs is not sufficiently strong to reach statistical significance. Only 29% of the Gunn students express an interest in the ASL AVMs, Icons 7 and 8. In contrast, 57% of the CSDF students select Icons 7 and 8. To deaf students like those at CSDF who heavily rely on visualization, facial, eye, and head behavior play a dominant role in their communication. Yet over all schools, the pattern of preferred icons is not as consistent for negative sentences as it is for interrogative. A possible explanation for the statistical significance of the interrogative icon but not for the negative one is that the question mark is more universal and familiar than the "no" symbol.

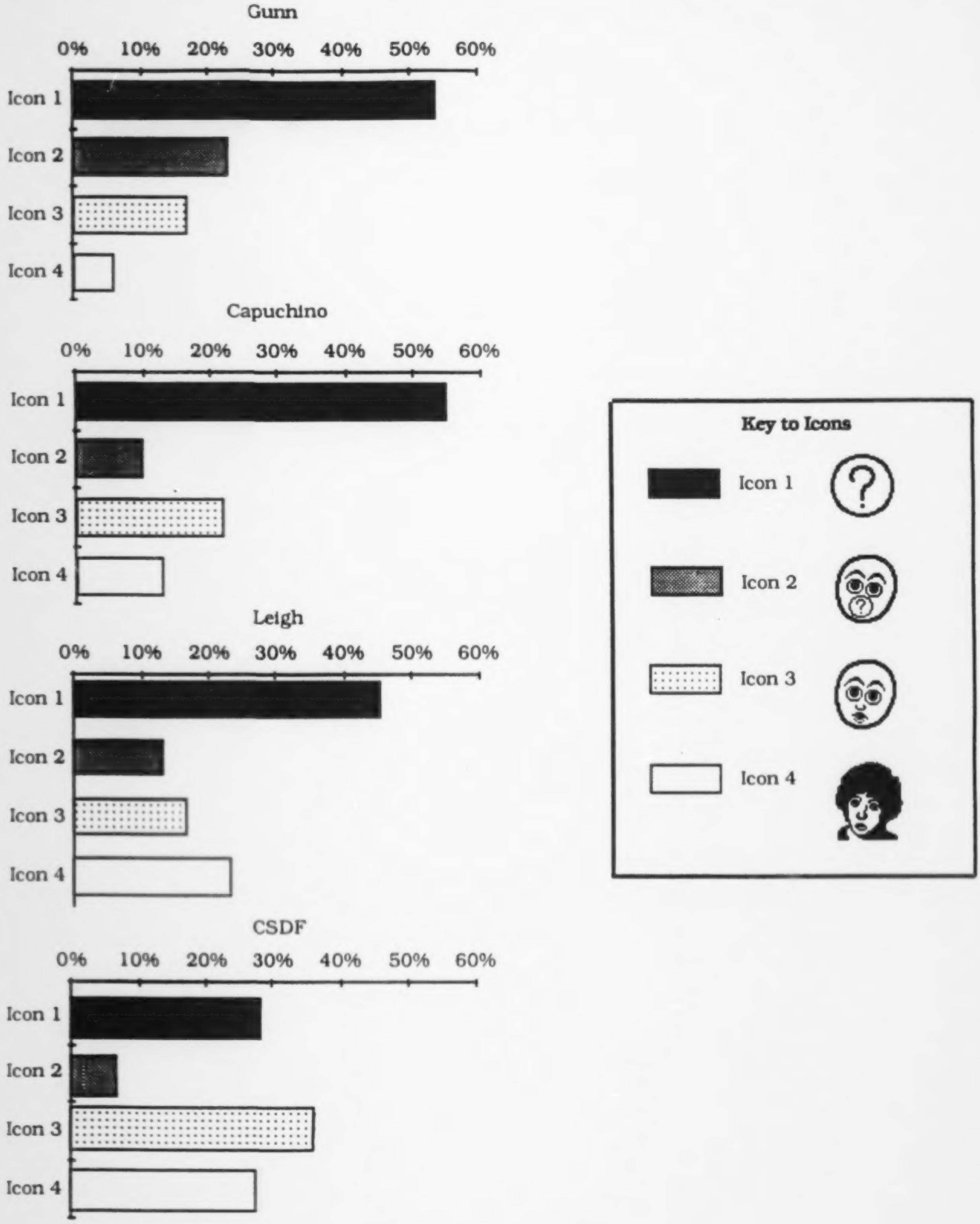

Figure 3. Percentage Ranking of Interrogative Icons by School Site

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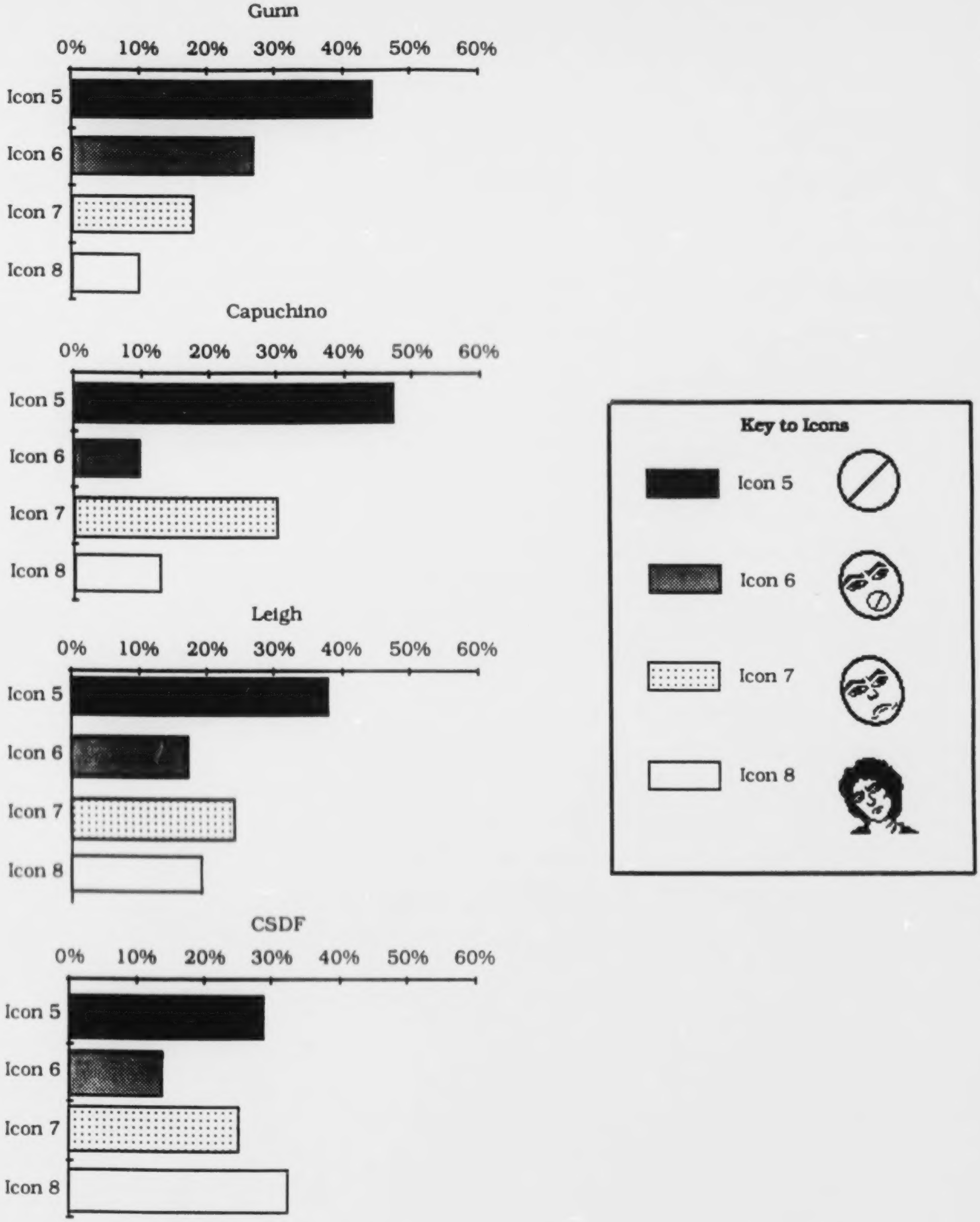

Figure 4. Percentage Ranking of Negative Icons by School Site

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The data from this preliminary study are encouraging. Students participating in *Choosing AVMs* respond positively to the opportunity to participate in the design of their own instructional material. The students' consistent preferences for specific icons, related either to abstract symbols (as the question mark) or to concrete depictions of ASL facial expressions, indicate that visual clues are related to students' primary mode of communication. Thus, different visual clues may be more effective for hearing-impaired groups with different language backgrounds.

4. Diagnostic Test of Negative and Interrogative Patterns

As an outgrowth of the literature review, particularly of the works of Quigley and his associates over a research period of 10 years (Quigley, 1978), and Rosenbloom (1981), we developed a list of all aspects of negative and interrogative structures that pose difficulty for deaf students. Using Quigley's Test of Syntactic Abilities (TSA) as a model, we developed a 100-item Diagnostic Test to determine (1) the structures with which secondary students experienced difficulty, and (2) the age at which they mastered those grammatical patterns. In May of 1988, we administered the Diagnostic Test of Negative and Interrogative Patterns (included in Appendix 5) to 72 students in grades 7-11 at CSDF, where there were a significant number of students who had sufficient prior linguistic knowledge to benefit from a syntax skill-development program, but who lacked the specific syntactical knowledge that the treatment, *The Yes-No Game*, was designed to teach. The results provided the necessary information to identify the specific syntactic problems of this population so that we could design the appropriate content material and sequence for the CAI treatment. By analyzing the frequency of mistakes on the Diagnostic Test, and considering the linguistic problems underlying these mistakes,expert linguists identified appropriate target areas for syntax instruction and remediation: yes-no questions which use (1) the BE verb, and (2) the DO, DOES, and DID auxiliaries. In addition, the test aided us in forming matched treatment/control groups.

5. *The Yes-No Game:* Development of Treatment Materials

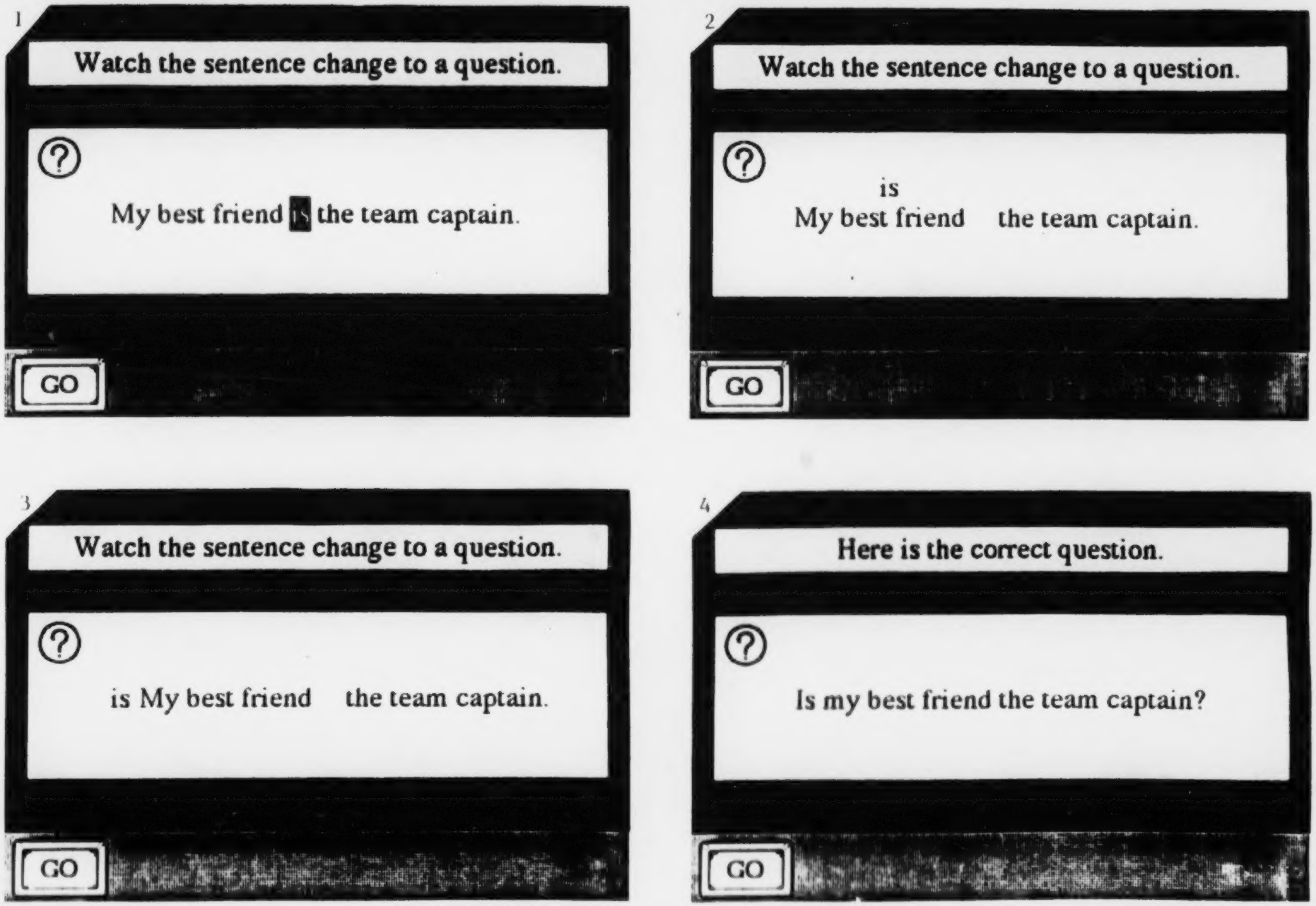
After the successful field test of *Choosing AVMs*, we planned the instructional design and content of *The Yes-No Game*. We were guided by the results of the project director's original research study at Stanford University, the new ideas regarding linguistic processing and CAI that the literature review revealed, the data from the Diagnostic Test, and the results from the *Choosing AVMs* experimental software. For *The Yes-No Game*, we designed a pair of studies that employed a multiplicity of visualization techniques to maximize learning for the deaf. First, to enhance the visualization of the interactive Macintosh instructions from *Choosing AVMs*, we added VideoWorks, a computer program which simulates motion pictures. Because the students were unfamiliar with the Macintosh, some had experienced difficulty manipulating the mouse. By creating a VideoWorks animated drawing of the moving, lifting, and repositioning of the mouse, *The Yes-No Game* explained visually how to use the Macintosh.

To guide learners through visual syntactic models, animated graphics picturing the transformation of sentences to questions preceded multiple practice opportunities for each syntactic structure taught. By visually depicting the transformation of a sentence to a question, as shown in Figure 5, the students were provided with an alternative to relying exclusively on printed text for reading comprehension. In *The Yes-No Game*, after a sentence appears, the auxiliary verb in the sentence (e.g., Ted **is** eating pizza at the party) is lifted above the other words and travels to the beginning of the sentence, where it drops into place. The empty space which held the auxiliary verb closes, the first letter of the fronted auxiliary verb is capitalized, and the period is replaced with a question mark at the end of the question (e.g., **Is** Ted eating pizza at the party?). Such visual representations of language structures and transformations are an integral part of both the instructional modeling and the immediate, corrective feedback in *The Yes-No Game*.

To capitalize on ASL's visualization and simultaneity of expression, computer graphics and animation have been incorporated to enhance comprehension, clarify meaning, and maximize the transfer of relevant knowledge. In addition, to engage and motivate the learners, we involved them as active participants in their instruction. First, students are provided with multiple opportunities to build their own — often humorous — sentences, which are automatically illustrated by the program. As shown in Figure 6, "Creating a Picture-Sentence," a student chooses the subject "mice" from among six possibilities (which are randomly selected from a file of 20 possible subjects), and the heads of two mice appear in the picture box above the word choices. Next, if the student chooses the verb "ski" from among six randomly displayed verbs, the picture changes to display the mice skiing. Similarly, direct objects and adverbials of time and place are selected; as each word is picked, a visual counterpart is added to the picture to represent the sentence as it is built by the student.

After the sentence is completed and its picture displayed, the "Building a Question" screen invites the student to create an appropriate yes-no question for the picture; Figure 7 displays a sample screen containing a picture and a matrix of possible words and phrases from which students build their own questions. Unlike most CAI, *The Yes-No Game* does not limit learners to making simple choices among a set of "right answers"; prior analysis of error patterns for the yes-no syntactic patterns are used to ensure that words and phrases were present that would allow learners to make common mistakes. For example, for a picture of Leo driving a truck every day, the randomly presented items could include a period, a question mark, and the following words: Leo, do, does, did, drive, drives, drove, a truck, and every day.

Learners benefit from detailed, corrective feedback for common errors (about 20 per structure) in the questions they build. Provision to review structural modeling was built into the



1

Watch the sentence change to a question.

My best friend is the team captain.

2

Watch the sentence change to a question.

is
My best friend the team captain.

3

Watch the sentence change to a question.

is My best friend the team captain.

4

Here is the correct question.

Is my best friend the team captain?

Figure 5. Transformation of a Sentence to a Question — *The Yes-No Game*

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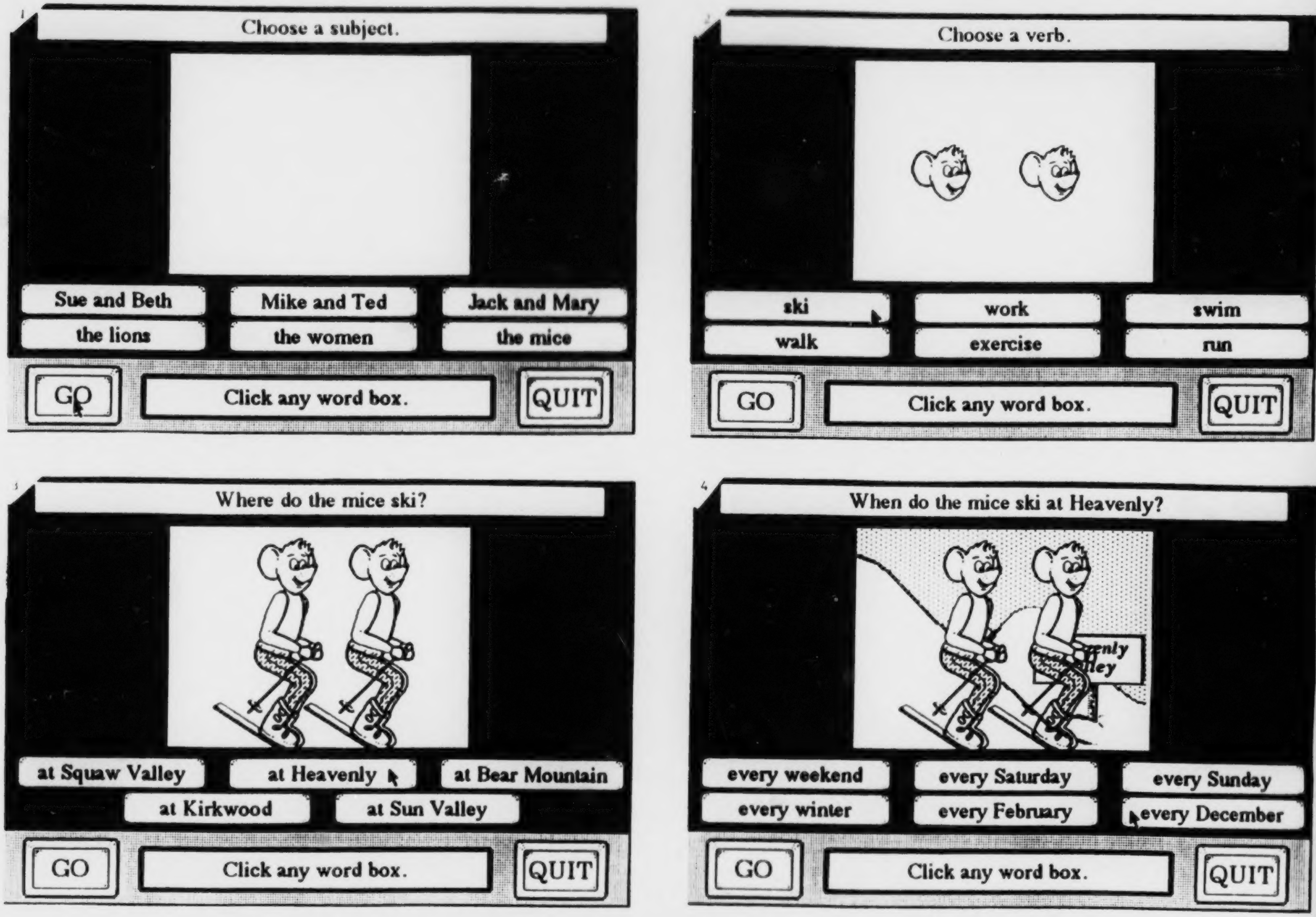

Choose a subject.

Sue and Beth
Mike and Ted
Jack and Mary
the lions
the women
the mice
GO
QUIT

Click any word box.

Choose a verb.

ski
work
swim
walk
exercise
run
GO
QUIT

Click any word box.

Where do the mice ski?

at Squaw Valley
at Heavenly
at Bear Mountain
at Kirkwood
at Sun Valley
GO
QUIT

Click any word box.

When do the mice ski at Heavenly?

every weekend
every Saturday
every Sunday
every winter
every February
every December
GO
QUIT

Click any word box.

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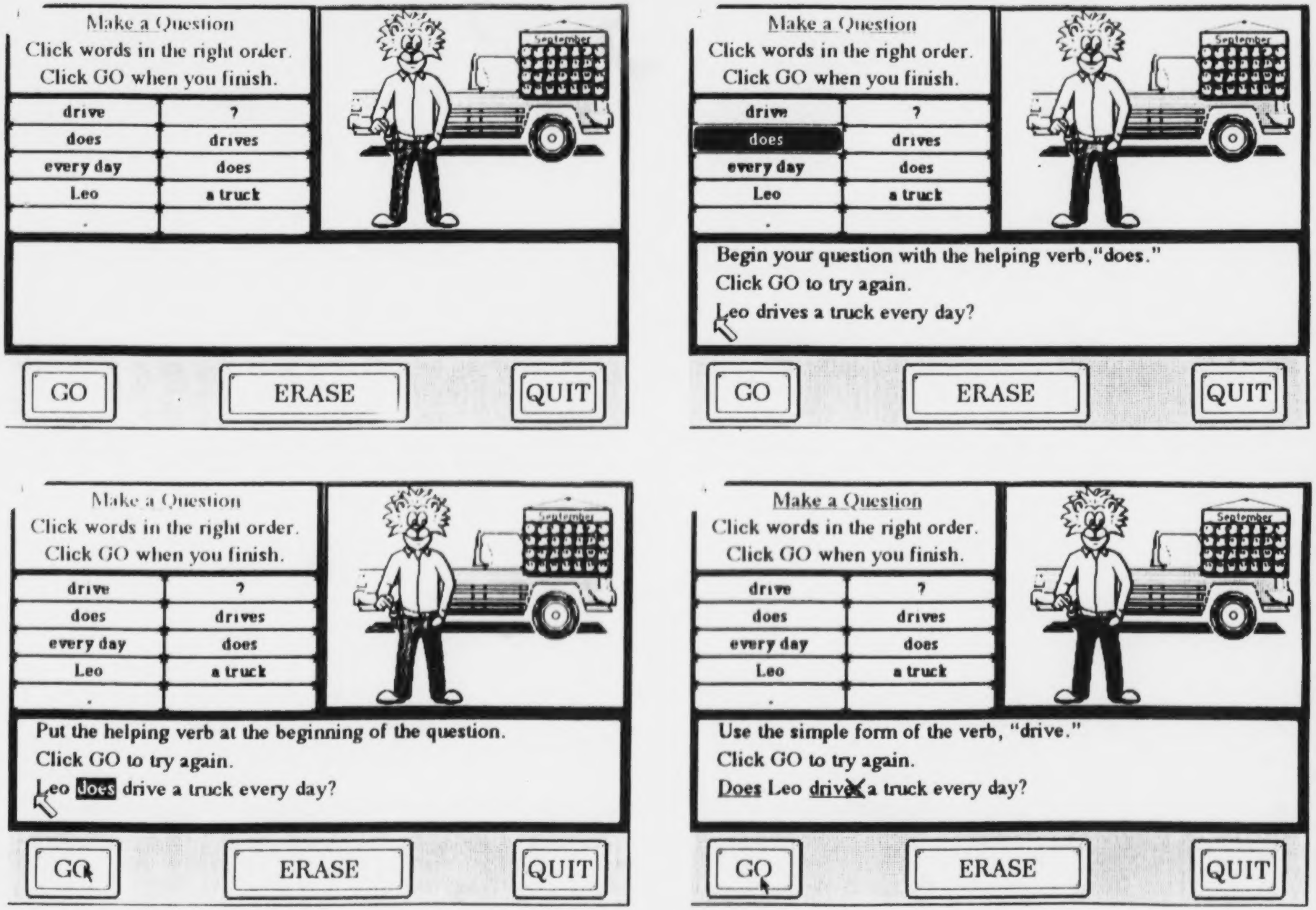
Figure 6. Creating a Picture-Sentence — *The Yes-No Game*



Make a Question
Click words in the right order.
Click GO when you finish.

drive
?
does
drives
every day
does
Leo
a truck
.
September
GO
ERASE
QUIT

Make a Question
Click words in the right order.
Click GO when you finish.

Begin your question with the helping verb, "does."
Click GO to try again.
Leo drives a truck every day?

drive
?
does
drives
every day
does
Leo
a truck
.
September
GO
ERASE
QUIT

Make a Question
Click words in the right order.
Click GO when you finish.

Put the helping verb at the beginning of the question.
Click GO to try again.
Leo does drive a truck every day?

drive
?
does
drives
every day
does
Leo
a truck
.
September
GO
ERASE
QUIT

Make a Question
Click words in the right order.
Click GO when you finish.

Use the simple form of the verb, "drive."
Click GO to try again.
Does Leo drive~~s~~ a truck every day?

drive
?
does
drives
every day
does
Leo
a truck
.
September
GO
ERASE
QUIT

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Figure 7. Building a Question — *The Yes-No Game*

program for instances when the specific, corrective feedback was insufficient to correct misunderstandings; however, the immediate feedback proved so effective that none of the subjects ever triggered the more detailed modeling reviews. The success of the feedback can probably be attributed to its visualization; the instructional program used video "effects" such as flashing, highlighting, and reverse video to emphasize instructional points. As illustrated in Figure 7, in addition to a brief, linguistically controlled message that responds specifically to the likely misunderstanding that led to the student's use of an incorrect auxiliary verb in the question just built, the error is highlighted in the student's question while its correct counterpart is flashed slowly in the word matrix, and its correct place in the question is indicated by a pointing arrow. If the student cannot correct the mistake after several tries, the student's incorrect question is visually transformed to the correct syntactic pattern through animation. During the *Yes-No* lessons, multiple opportunities for initiating such interactive practice are provided.

Yes-No I Study: Building Questions with the BE Verb

Programmed in HyperCard to run on a Macintosh with a hard disk, this first study investigated teaching yes-no questions with BE: as a main verb (e.g., **Is** Pam the captain of the softball team?), and as an auxiliary verb with present and past progressive, transitive and intransitive verbs, direct objects, and adverbials of time and place. (E.g. **Were** the boys eating pizza at the party?) Four syntactic patterns in *Yes-No I* increased in length and difficulty as the students proceeded through the program.

Sample

To ensure the accessibility of a large number of high school subjects who had sufficient prerequisite English syntactic knowledge to benefit from *The Yes-No Game*, but who lacked the ability to form yes-no questions, we decided to conduct the intervention at a residential school for the Deaf. After the principal and teachers screened out those students who had insufficient prerequisite syntactic knowledge, and those whose English language placement indicated they had already mastered the treatment material, the *Yes-No I* Screening/Pre-test was administered to 76 eighth, ninth, tenth, and eleventh grade students. The subjects for the intervention were selected and matched on two criteria: their recent SAT-HI reading scores, and their performance on the *Yes-No I* Screening/Pre-test (which is included in Appendix 5.) For each pair, subjects were randomly assigned to either the treatment or control group; the process resulted in two groups with comparable syntactical knowledge of written English. The sample consisted of 17 treatment and 15 control subjects, ages 14 to 18.

Methodology

The intervention was tested using a classical hypothetico-deductive model. Two null hypotheses were posed: (1) CAI designed to teach English syntax to deaf high school students would have no effect on their acquisition of syntactic knowledge, and (2) CAI with AVM icons would not improve students' syntactic performance more than CAI without AVM icons. The treatment group received animated AVM icons embedded in their CAI presentations to link the English syntactic structures to visual ASL constructs; the control group received identical CAI without the animated AVMs. At the test site, the goals of the program were discussed with the students. The pencil and paper Screening/Pre-test, which consisted of two parts, was administered two weeks prior to the CAI intervention. Part I was modeled on the diagnostic sub-tests for question formation of Quigley's TSA and required the recognition of correct English grammaticality; composed of 25 multiple choice items, Part I closely resembled the CAI intervention. Part II consisted of 10 open-ended items for which students were asked to write an appropriate question in response to a stimulus of one to three short sentences. A question that could be interpreted as having been logically and meaningfully stimulated by the short paragraph, and did not contain syntactic errors for which the subjects had received instruction, was said to be a correct response. Part II involved active sentence construction and therefore had more face validity than Part I; however, this requirement for language production made Part II a more difficult task for the students.

The CAI treatment, *The Yes-No Game I,* was limited to two lessons which could be completed by an average subject in approximately two class periods (90 minutes). Students proceeded through *The Yes-No Game* individually; the learner controlled the pace. Within 48 hours after using the program, a post-test was administered. The format, level, and administration of the pre- and post-tests were comparable; the syntactic structures in each of the test items were identical, but the nouns and the verbs were different. The internal consistency of the tests were assessed using Cronbach's Alpha. The reliability coefficients were uniformly high: .73 for the pre-test, and .78 for the post-test of Part I, the multiple choice section which tested the students' receptive language skills. For Part II, which evaluated the students' expressive language, the Alpha coefficients were .69 for the pre-test and .52 for the post-test.

To supplement the experimental methodology, we trained observers to collect data on the subjects' visible responses to the instructional materials. Of particular interest were the non-verbal signals indicating that learners were, or were not, responding in a manner that showed alertness, attention, and positive affect.

A record keeping module was integrated in *The Yes-No Game* to facilitate data collection, and to provide easy access to information of the students' performance while they interacted with the program. Continually updated *Records* of correct and incorrect responses enabled the research observers to check the subjects' progress during the intervention. Detailed *Histories* of every keystroke and response in the syntactic practice, as well as the time between each response, were designed to be converted to text files for later analysis of the sequence pattern of the subjects' responses. Observational logs and exit-interview notes were reviewed to identify learner response patterns that appeared to be consistently associated with particular components of the instructional materials, and with particular records of performance. For example, data on learner attentiveness to various screens were evaluated together with learner performance on these screens. *Yes-No I* insights gained from the observational data and the *Histories* were helpful in designing and developing the *Yes-No II* intervention.

Results and Discussion

The study findings support the assertion that the CAI intervention would increase the syntactic knowledge of deaf high school students. In order to study the effect of the instructional intervention (i.e., the lesson), as well as the relative importance of other variables (the AVM icon, and reading ability) on test scores, we performed a series of multiple regression analyses. Other than the lesson, the only variable that was reliably associated with a difference in the test scores was reading ability as measured by scores on the SAT-HI; no effect of the AVM icon was evidenced.

Part I - The Multiple Choice Section. The first null hypothesis was rejected; in other words, CAI designed to teach English syntax to deaf high school students appears to have a significant effect on their acquisition of syntactic knowledge. As shown in Figures 8.2 and 8.3, the results of the intervention clearly demonstrate the effectiveness of the program . The means for Group A (who had the CAI-Syntax Treatment with the AVM icons) rose from 55.4 to 74.6 ($p<.01$); for Group B (who had the same CAI without the embedded AVMs) the means rose from 60.47 to 81.88 ($p<.01$).

Multiple regression analyses reveal statistically significant pre- to post-test gains. Group A which had the CAI without the AVM icons was as successful in improving their syntactic performance as Group B with the AVMs. The multiple regression analyses which controlled for the effects of the lesson and reading comprehension, revealed no significant influence of the AVM icon on pre- post test gains. A possible explanation for the lack of significance of the AVM is that the other highly visual aspects of *The Yes-No Game I* were so effective that the AVM icon conveyed less of an impact as a single factor in the overall treatment effect; pictures conveyed the meaning of the sentence-question, flashing and highlighting provided instructional clues, and arrows provided word placement information.

Interestingly, the reading score was not significantly related to pre- post test gains. This result is somewhat unexpected; usually, reading comprehension scores account for significant parts

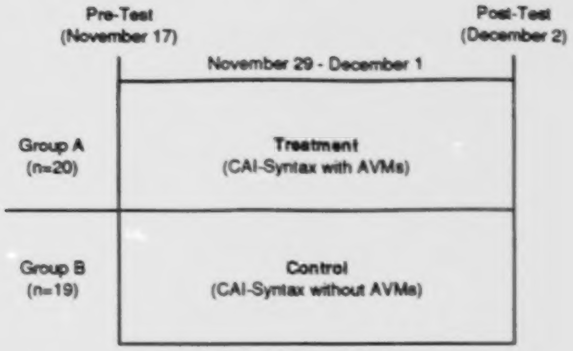
Pre-Test
(November 17)
Post-Test
(December 2)
November 29 - December 1
Group A
(n=20)
Treatment
(CAI-Syntax with AVMs)
Group B
(n=19)
Control
(CAI-Syntax without AVMs)

Figure 8.1 Schematic Diagram of the Experimental Design

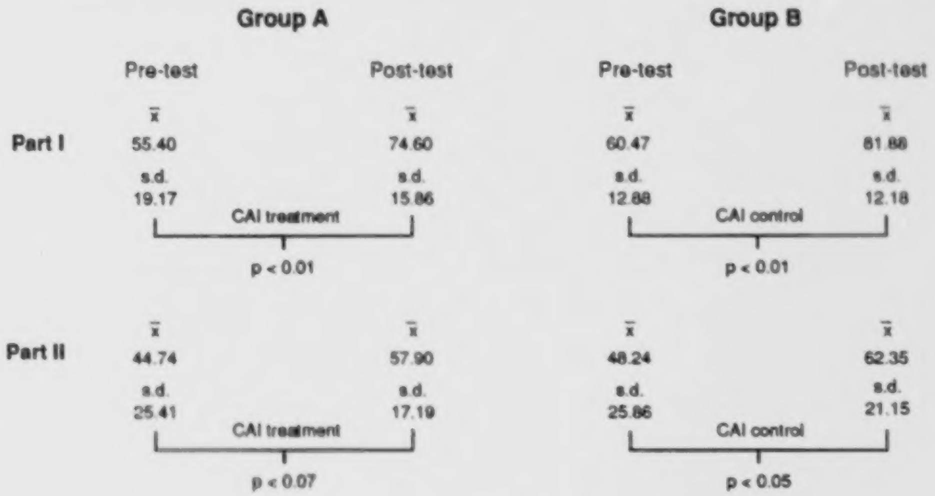
Group A
Group B
Pre-test
Post-test
Pre-test
Post-test
Part I
x̄
55.40
s.d.
19.17
x̄
74.60
s.d.
15.86
CAI treatment
p < 0.01
x̄
60.47
s.d.
12.88
x̄
81.88
s.d.
12.18
CAI control
p < 0.01
Part II
x̄
44.74
s.d.
25.41
x̄
57.90
s.d.
17.19
CAI treatment
p < 0.07
x̄
48.24
s.d.
25.86
x̄
62.35
s.d.
21.15
CAI control
p < 0.05

Figure 8.2 Comparison of Group Means of Test Scores

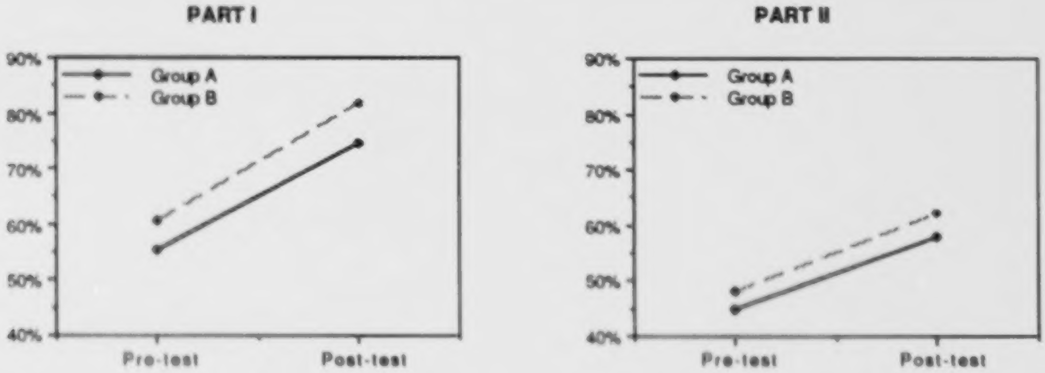

Figure 8.3 Effects of CAI Instruction and Alternate (Control) CAI

Figure 8. *Yes-No I* Results

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of the outcome in any kind of language intervention, especially with deaf subjects. This result points to the potential for highly visual CAI to assure some success even for deaf subjects with relatively lower level reading scores, perhaps because the computer enables the utilization of visuals and simultaneity of expression, which are absent in standard teaching materials.

Part II —The Language Production Section. In the language production test, both groups improved at levels of near statistical significance. Group A improved from a mean of 44.74 on the pre-test to 57.90 on the post-test ($p<.07$), and Group B from 48.24 to 62.35 ($p<.05$). Multiple regression analyses (which included the effects of the intervention, the students' reading ability, and the AVM icon as independent variables) reveal that, as in Part I, the AVM icon is not significantly related to pre- post test gains. In addition, these regression analyses show that pre-post-test gains in Part II are significantly related to reading scores ($p<.01$). Yet, even after inclusion of the reading scores in the regression, the gains attributed to the intervention alone remain at near significant levels ($p<.05$ and .07)

Whereas Part I, which involves recognition of grammatical correctness, primarily in syntax, is very closely related to the task taught in the lessons, success in the items in Part II is dependent upon the comprehension of the 10 stimulus paragraphs, i.e. the multiple tasks involved in reading, such as making inferences from context clues. Therefore, it is not surprising that the reading scores had a significant influence on achievement in Part II and not in Part I. The fact that students demonstrate significant gains, regardless of reading comprehension ability, may indicate the power of visually oriented computer material to not only enable students to improve their language recognition skills, but more importantly to transfer that knowledge to their own writing production.

In order to supplement the results obtained by the statistical analyses of the pre- and post-test scores, an error analysis of the sentences actually produced in the pre- and post-tests was undertaken. The analysis clarified all of the mistakes found in the tests into 25 error categories. The statistical results of the error analysis are summarized in Table 1. In addition to the total number of errors found in the total corpus formed by the pre- and post-test responses, the table also reports pre- and post results for selected error categories which seemed particularly related to the grammatical procedures taught by the treatment. These categories — some derived from collapsing categories actually used in the analysis — are the following:

A. Substitution of a possible pattern for the one expected by the test stimulus (e.g., "How do you feel?" instead of "Were you sick?") This response is not really an error but constitutes a failure of the test to evoke the desired pattern.

B. Confusion of second and third person in the subject to be addressed.

C. Use of a pattern or a total sentence which is semantically impossible in response to the stimulus.

Table 1. *Yes-No I* — Summary of Error Analysis

	Pre-Test	Post-test
Total number of errors	478	352
Selected Error Types		
A	65	40
B	39	71
C	74	44
D	41	30
E	51	33
F	39	22

Table 2. *Yes-No II* — Summary of Error Analysis

	GROUP A			GROUP B		
	Test 1	Test 2	Test 3	Test 1	Test 2	Test 3
Total number of errors	236	194	198	196	154	165
Selected Error Types						
A	13	15	19	13	6	12
B	54	30	35	37	33	28
C	18	13	22	13	13	12
D	20	15	9	15	24	13
E	11	13	4	13	10	7
F	18	22	15	12	9	14

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D. A word omitted from what appears otherwise to be a correct response.

E A word added to an otherwise correct response.

F The pattern used is incorrect because of confusion in word order.

The error analysis also revealed other frequent errors which are often mentioned in the literature dealing with English produced by the Deaf (e.g., omission of the article, and dropping of verbal and noun morphemes like final "s"). However, further analysis of these errors did not seem germane or relevant to purposes of the intervention and of this report.

Statistical interpretation of the data of Table 1 must be undertaken with some caution, primarily because the error analysis shows only type and frequency of errors in pre- and post-test but not the opportunity to commit them. Opportunities were at best only roughly equivalent between pre- and post-test, primarily because omission of opportunity by totally omitting responses is not taken into account in the error counts, and because students could create their own opportunities for errors by responding in unexpected patterns. Still, the pre- post-test comparison scores indicate improvement as a result of the intervention. In some categories (like "A"), the decrease in errors may simply be due to the students' recognizing the intention of the treatment and/or the test maker. The gain (i.e., decrease in error) in the other categories (especially "F") seems strongly associated with the success of the intervention. In the case of one error there seems to be an increase from pre- to post-test, namely in the confusion of second and third person (especially the substitution of the third person for the second). This semantic error, which was not specifically dealt with in the treatment, is among the most frequently found in the corpus of pre- and post-test responses and should become the object of further study and planned intervention.

Yes-No II Study: Building Questions with the DOES, DO, and DID

The encouraging results from the Yes-*No I* study guided us in our collection of data regarding highly visual syntactic CAI in *Yes-No II*. Detailed notes from the trained observers, and comments from the subjects' exit interviews provided important information in the design, development, and refinement of *Yes-No II*. Although HyperCard had enabled us to develop excellent graphically oriented CAI in a relatively short period of time, we found that the complex, interactive nature of *Yes-No I* caused it to run too slowly in HyperCard; to test *Yes-No I* with the necessary speed, we rented powerful Mac IIs for the CSDF *Yes-No I* intervention. Because we wanted our CAI to run quickly on less costly machines (the Mac Plus with a hard disk), we turned to Mac App, an object-oriented programming language that efficiently implements the standard features of most Macintosh application programs. Because MacApp is "compiled" rather than "interpreted" (as is HyperCard), *Yes-No II* ran so quickly that we had to incorporate "delays" to provide the students sufficient time to think and respond.

In contrast to the slow rate of learning syntactic structures that deaf students usually experience (Quigley, 1978), our subjects proceeded with such facility through *Yes-No I* that they requested longer and more difficult material, which we provided in the *Yes-No II* program. Because the AVM icons were not significantly associated with pre- post-test gains in the *Yes-No I* Study , we did not embed them in the practice sections of *Yes-No II*. Rather, we incorporated the AVM icons only in the initial transformation screens; to indicate that a sentence had been transformed to a question, the AVM icon floated across the question to replicate the ASL facial expression that is present as a linguistic marker during the signing of a yes-no question. Responding to suggestions from students, teachers, and observers, we expanded the "graphics vocabulary" to provide more variety, and we refined the graphic interface and visualization techniques, such as the word placement arrow and the GO button. Because the majority of the subjects were so enthusiastic about *Yes-No I* and had demonstrated significant gains from pre- to post-testing, we did not consider any major pedagogical or structural changes.

Sample

The *Yes-No II* intervention at CSDF in April, 1989 was similar to the *Yes-No I* intervention in December of 1988, except for a modification of the experimental design and a small difference in the study sample. Of the original sample of students, two subjects who had been absent for the *Yes-No I* intervention were present for *Yes-No II*, and five students who were present for *Yes-No I* did not participate in *Yes-No II*. The same subjects were used because we wanted a comparative evaluation of *Yes-No I* and *II* by the students so that we could determine whether the suggested improvements that we had implemented were successful. After accounting for absences, the final sample consisted of 17 treatment and 15 control subjects, ages 14 to 18 from CSDF, the residential school for the Deaf.

Methodology

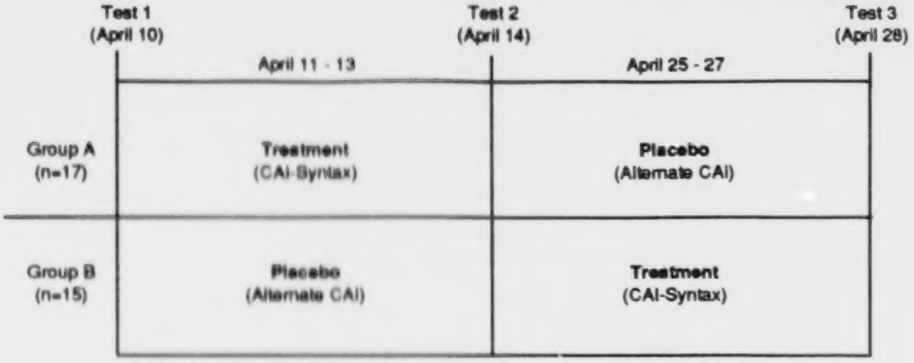
As shown in Figure 9a, this study was a two phase intervention. One week prior to the first phase, Test 1 was administered to both the treatment and control groups: the pencil and paper pre-test was composed of 25 multiple choice items, and 10 open-ended items for which students were asked to write an appropriate question in response to a stimulus of one to three short sentences. The treatment group (A) completed the three lessons in the CAI-Syntax program in two to three class periods (45 to 135 minutes). To measure the impact of a possible Hawthorne effect, control group (B) used an alternate computer program in an unrelated subject area for the same period of time. Within one day after completing the first phase of the CAI intervention, Test 2 was administered to both groups. In order to arrive at an estimate of the influence of learning due to test taking rather than treatment, and to increase the treatment sample, the following procedure was used. Two weeks after the administration of Test 2, Group A used the alternate computer program, and Group B used the CAI-Syntax program. The next day, Test 3 was administered. The format, level, and administration of Tests 1, 2, and 3 were comparable; the syntactic structures in each of the test items were identical, but the nouns and verbs were different. The internal consistency of the three tests were assessed using Cronbach's Alpha. The reliability coefficients were uniformly high for both parts of the tests: for Part I they were.76, .77 and .79; for Part II they were 73,.77 and .78.

Correlations between Parts I and II of each of the three test forms seem to indicate that, as expected, they test highly related, but not identical skills ($p<.05$). The parallelism of the different forms of the test being used is shown by the high correlations between them: for Part I the rs ranged from .54 to .59, and for Part II from .63 to .72. Further test development research, including item analyses, is still necessary to improve the usefulness of these tests.

Results and Discussion

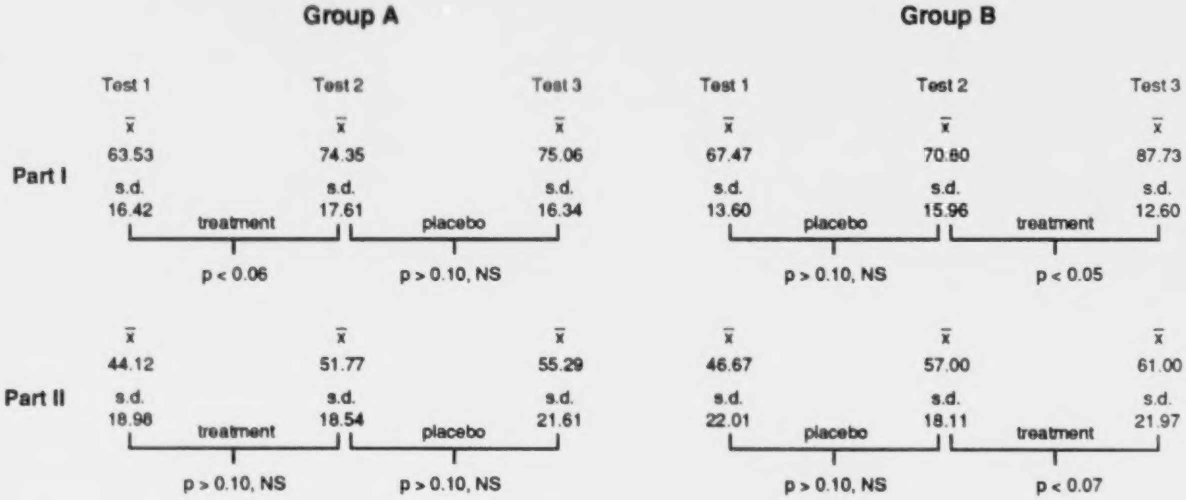
Part I - The Multiple Choice Section. As displayed in Figures 9b and 9c, both phases of the intervention are associated with pre- post -test gains. As determined by Analysis of Variance (ANOVA) and paired contrasts using a "Least Significant Difference Test (LSD)," modest gains in syntax knowledge were made by each group receiving the CAI-Syntax treatment: the means for Group A rose from 63.53 in Test 1 to 74.35 in Test 2 ($p<.06$) , and the means for Group B rose from 70.80 in Test 2 to 87.73 in Test 3 ($p<.05$). In comparison, the control group (B) demonstrated no significant gains with the alternate CAI from Test 1 to 2. Even when Group A was tested two weeks after the CAI-Syntax treatment, their Test 3 scores did not fall below the level of Test 2, suggesting that these improvements in syntactic knowledge were retained. In our experience, these findings are impressive considering the brief duration of the treatments.

Because in English language studies with this population, there is a potential confounding effect of students' reading abilities, we decided to repeat the analyses in the previous section, but include an assessment of the interaction of reading ability with the intervention (i.e., students with high reading ability would benefit more from the CAI Syntax treatment than students with lower reading scores). The procedure we employed was Analysis of Covariance (ANCOVA). Results indicate no independent interaction effects for Part I. This finding is not surprising considering the nature of this part of the test, which requires only recognition of grammatical correctness, not reading comprehension of paragraph stimuli as in Part II.



	Test 1 (April 10) — April 11 - 13 — Test 2 (April 14)	Test 2 (April 14) — April 25 - 27 — Test 3 (April 28)
Group A (n=17)	**Treatment** (CAI-Syntax)	**Placebo** (Alternate CAI)
Group B (n=15)	**Placebo** (Alternate CAI)	**Treatment** (CAI-Syntax)

Figure 9.1 Schematic Diagram of the Experimental Design



Group A

		Test 1		Test 2		Test 3
Part I	x̄	63.53		74.35		75.06
	s.d.	16.42	treatment	17.61	placebo	16.34
			p < 0.06		p > 0.10, NS	
Part II	x̄	44.12		51.77		55.29
	s.d.	18.98	treatment	18.54	placebo	21.61
			p > 0.10, NS		p > 0.10, NS	

Group B

		Test 1		Test 2		Test 3
Part I	x̄	67.47		70.80		87.73
	s.d.	13.60	placebo	15.96	treatment	12.60
			p > 0.10, NS		p < 0.05	
Part II	x̄	46.67		57.00		61.00
	s.d.	22.01	placebo	18.11	treatment	21.97
			p > 0.10, NS		p < 0.07	

Figure 9.2 Comparison of Group Means of Test Scores (Significance levels determined by ANOVA "Least Significant Difference" test of paired contrasts)

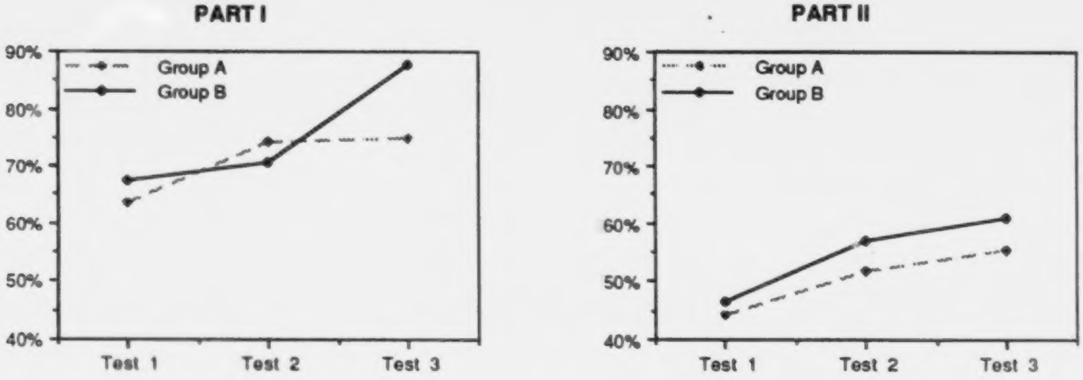


Figure 9.3 Effects of CAI Instruction and Alternate (Placebo) CAI

Figure 9. *Yes-No II* Results

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Part II - The Language Production Section. To investigate the effects of CAI-Syntax intervention on language production , we again used ANOVA and LSD procedures to compare group means. Although there is an increase in test scores for both groups (with Group A improving from a mean of 44.12 to 51.77, and Group B improving from 57.00 to 61.00), only Group B demonstrated a marginally significant increase (p<.07) after the intervention. Two aspects work against the intervention having a pronounced affect on students' syntactic ability, as measured by the open-ended Part II test: (1) The material in *Yes-No II* is much more difficult than the material in *Yes-No I*, and (2) deaf students require years of schooling to learn, let alone master, the use of the auxiliaries, DOES, DO, and DID (Quigley, 1978). Under these circumstances, even the marginal gains evidenced in Group B after the treatment are encouraging.

As in the analyses for Part I, we used ANCOVA to test for the effects of an interaction between the intervention and the reading scores. For both Groups A and B there was a significant interaction which was independent of any main effect of the intervention (for Group A, F=5.04, p<.01; for Group B, F=7.59, p<.001) indicating that students with high reading ability benefit more from the CAI-Syntax treatment, as measured by a test requiring comprehension skills, than do students with lower reading ability.

Just as in the evaluation of the *Yes-No I* intervention, statistical analyses of the test scores were supplemented by the error analysis of the sentences produced by the students in Part II of the test. As summarized in Table 2, the categorization system used was slightly different from the one applied in the *Yes-No I* intervention, but for the purposes of of reporting, the categories are slightly modified to correspond exactly to those used in the presentation and discussion of Table 1. Again, the frequent mistakes known to relate to specific problems of the Deaf, but not to the experiment under consideration, are omitted in the presentation and appear only in the reported tables.

Interpretation of error frequencies across pre-tests and experimental interventions is, of course, subject to the cautions previously expressed (especially unequal opportunity for error from test to test) in the results section of *Yes-No I*. The overall patterning of errors points to the following:

1. The control group (B) seems somewhat stronger than the experimental group throughout all three tests.
2. An overall decrease of errors takes place going from Test 1 to Test 2. The results seem approximately the same for the experiment and control groups, and perhaps is due to familiarity with the type of test being used.
3. The results of the third test administration are not very different from those of the second. Neither retaking of the test (Group A) nor treatment (Group B) change the overall incidence of errors.

Inspection of the patterning of error incidence in the subcategories does not suggest any specific interpretation. Specifically, treatment related categories do not pattern very differently from the overall error content, or show a marked decrease inviting speculation relating to the specific effects of the preceding treatments (e.g., A possible treatment effect in error category B in Group A — a drop from 54 in Test 1 to 38 in Test 2 — is not matched by a similar drop in Group B, where the decrease in errors is only from 33 to 28.) It can be noted again that word order confusion — the problem most directly addressed by the treatment — is a less frequent error than the confusion in the person to be used as the intended addressee of the question.

Yes-No II with Third Graders

When several primary school educators learned of the research study of *The Yes-No Game* in the high school on the campus, they inquired about its potential benefit for their younger students. Having recently introduced yes-no questions to her students, and after reviewing the program thoroughly, the teacher of a third grade class requested our evaluation of *Yes-No II* with her students, an exceptionally bright group. The opportunity for a supplementary investigation to evaluate our approach and materials with a younger population was tempered by a concern that the program had been designed for high school students; the focus of interest and vocabulary (although linguistically controlled at a second grade level), centered on an older population of average intelligence who had experienced persistent difficulty with English syntax. Deciding to help the younger group with unfamiliar words (e.g., jog and exercise), we proceeded with the intervention. In the morning Test 1 was administered to the class; the sample was small (n=5), an expected problem of research with low-incidence handicap populations. In three 30 minute periods, all of the subjects completed the first two lessons in *Yes-No II*, and began the third lesson; two students completed this last lesson. That afternoon, Test 2 was administered. One week later, Test 3 was administered to determine the retention level.

The third graders were overwhelmingly enthusiastic; the researcher-observer had to insist that they stop at appropriate intervals, and that they leave the *Yes-No Game* for recess and lunch. Although the older subjects had enjoyed the program, and laughed appropriately at the humorous drawings, the younger group squealed with delight. The success of this brief study is demonstrated in Figure 10; the mean for Part I rose from 44.0 in Test 1 to 74.0 ($\underline{p} < 0.01$) in Test 2, and from 53.4 to 66.4 ($\underline{p} < 0.08$) for Part II. The teacher was amazed that in a very short period of instructional time the students learned to use structures that they had been unable to learn with conventional teaching material. As a result of this intervention, the prospects of using our approach of highly visual CAI with a wide age range of deaf students appears very promising.

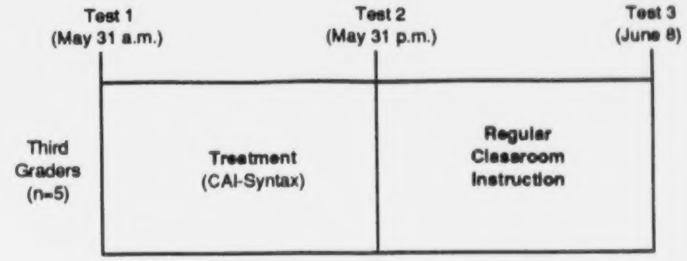
Test 1
(May 31 a.m.)
Test 2
(May 31 p.m.)
Test 3
(June 8)
Third
Graders
(n=5)
Treatment
(CAI-Syntax)
Regular
Classroom
Instruction

Figure 10.1 Schematic Diagram of the Experimental Design

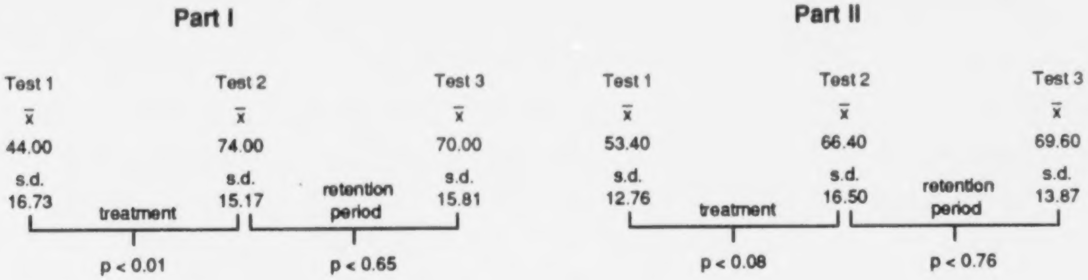
Part I
Test 1
x̄
44.00
s.d.
16.73
Test 2
x̄
74.00
s.d.
15.17
Test 3
x̄
70.00
s.d.
15.81
treatment
retention period
p < 0.01
p < 0.65
Part II
Test 1
x̄
53.40
s.d.
12.76
Test 2
x̄
66.40
s.d.
16.50
Test 3
x̄
69.60
s.d.
13.87
treatment
retention period
p < 0.08
p < 0.76

Figure 10.2 Comparison of Group Means of Test Scores

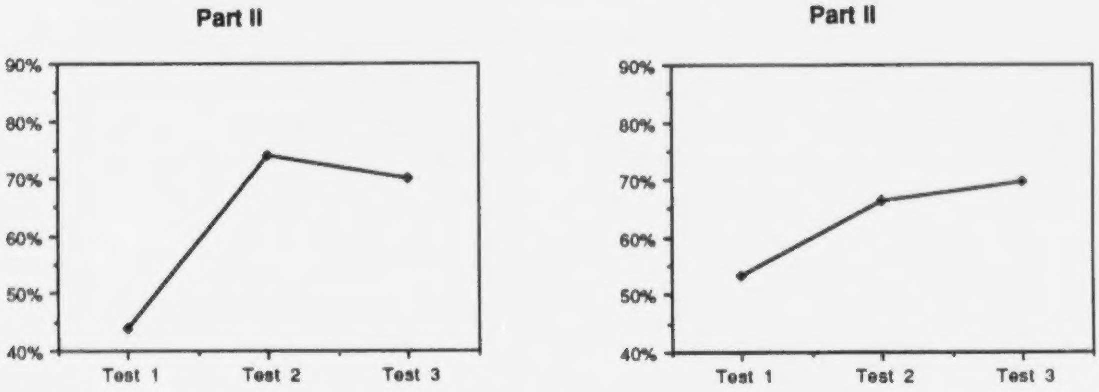

Figure 10.3 Effects of CAI Instruction on the Syntax Skills

Figure 10. Third Grade Results of *The Yes-No II Game*

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Reporting and Dissemination

FY88/89 Invitational Research Symposia on Special Education Technology: 6/88 & 6/89.

The project director attended the annual invitational symposia, which brought together individuals actively involved in investigating the use of technology in special education. At the '88 meeting, which focused on exchanging information about the production of knowledge in the field (mapping, assessing, and broadening the knowledge base), the project director displayed the *Choosing AVMs* software. The focus of the '89 meeting, "Advancing the Use of Technology: The Research: Practice Connection, " was most appropriate for the project director to present *The Yes-No Game* on the Macintosh. The researchers, teachers, and administrators were complimentary about the technological and pedagogical quality of the software, especially the sophisticated educational graphics.

OSEP Research Project Directors' Conferences: 7/88 & 7/89

The project director attended these annual meetings, which encourage and foster ongoing communication among members of the special education research community. Highlighted sessions in June of 1988 focused on the social context of research design, the influence of policy in special education, and naturalistic inquiry. The 1989 general sessions focused on the integration of multiple methodologies in examining a research question, and methodologies to extract meaning vs. relationships; a panel discussion explored the importance of individual differences in special education. Of particular value to the project director was the session which focused on "language research: current issues in intervention." Researchers in deaf education, as well as other areas, explored the pressing methodological and design issues in language research, as well as the factors related to implementation that should be researched as part of the process of translating treatments — shown to be effective in empirical studies — into practice.

ADCIS Presentation, Publication, and Honorable Mention for Best Paper Award: 11/88

At the 30th International ADCIS (Association for the Development of Computer-Based Instructional Systems) Conference in Philadelphia, the project director presented a paper, "Effective CAI for the Hearing-Impaired." The monograph, which was in published in the ADCIS Proceedings in November of 1988, received an Honorable Mention for the ADCIS Best Paper Award. The article, which is included in Appendix 1, discussed the results of two pilot studies, *Using Articles* and *Choosing AVM* , two computer programs were designed to determine the effectiveness of highly visual CAI for the Deaf.

CEC-TAM Presentation: 12/88.

The project director disseminated her most current work on the AVM Project in a presentation entitled, "Using CAI with Advanced Visual Markers (AVMs) to Teach English Syntax to the Deaf" at the National Conference on Special Education and Technology of the Council of Exceptional Children in Reno, Nevada. The presentation displayed screens from *The Yes-No I Game* and discussed the preliminary findings of this first instructional study.

Informal Dissemination — 1988 & 1989

To inform educators of the research potential of state-of-the-art CAI to improve English language acquisition and usage, the project director has accepted opportunities to present her research at schools with programs for the hearing-impaired; as a result of her presentations, five schools volunteered to participate in the AVM Project. To develop deaf awareness in those less knowledgeable of the disability, Ms. Fogel has presented the research that she and others are conducting to such groups as the Board of Directors of the American Institutes for Research.

Submission of Summary Paper to AERA — 8/89.

A summary paper, "A Computer Approach to Teaching English Syntax to Deaf Students," was submitted for consideration for presentation at the April, 1990 AERA Annual Conference. The paper discusses the results of the most recent intervention, the *Yes-No Game II*, in which.gains in syntax knowledge were made by the subjects receiving the CAI-Syntax intervention. Appendix 6 includes the summary paper.

Reports to OSEP: Year 1 Report (12/88) and Final Report (10/89)

The Year 1 and Final Reports were prepared for submission to the Office of Special Education Programs of the Department of Education. The results of multiple phases of the testing and treatment of highly visual CAI specifically designed for the Deaf are presented in relation to the project objectives of the AVM Project. The report of each study presents findings first, followed by their methodological implications and plans for further research in utilizing linguistically controlled, highly visual CAI to teach English syntax to the Deaf.

Statement of Accomplishments

At the end of the AVM Project, we have accomplished a significant amount of important work:

- Conducted a search and review of the literature in several fields related to the project: education of the Deaf, English language instruction for deaf and second language students, the direct instruction approach and its application to CAI, instructional design for computer assisted language learning, and linguistic studies of ASL and other communication modes of the Deaf

- Built an expert Advisory Panel for consultation regarding the development of AVM material

- Developed a Macintosh prototype, *Using Articles*, to acquaint deaf education programs with our approach and encourage them to participate in our research study

- Developed the *Choosing AVMs* software

- Conducted the *Choosing AVMs* study to determine differences in the ranking of AVMs by four groups of deaf students with different primary modes of communication

- Developed a Diagnostic Test of Interrogative and Negative Patterns to ascertain the content of the instructional intervention and the appropriate population for the CAI intervention

- Designed assessment instruments to be used in our experiments and by others in the field: two forms of the Test of Yes-No Questions with the BE verb, and five forms of the Test of Yes-No Questions with DOES, DO, and DID.

- Developed the instructional material for *The Yes-No Game*, CAI syntax material designed specifically for deaf students

- Conducted three interventions of *Yes-No I and II*, with both elementary and secondary students, to determine whether linguistically controlled, highly visual software will enable deaf students to learn English syntactic structures with which they have experienced difficulty

- Reported and disseminated results of three CAI studies designed specifically for deaf students, including a published article, "The Effectiveness of CAI for the Hearing Impaired," which received Honorable Mention for the best paper award in the ADCIS competition, presentation at CEC-TAM and ADCIS, and a summary paper to AERA.

Summary of Project Findings

The AVM project, which dealt with the application of computer-based instruction to the teaching of English to the Deaf, attempted to determine whether highly visual techniques associated with ASL could be effectively utilized in computer-assisted syntax instruction designed specifically for deaf high school students. An introductory phase of the experiment, *Choosing AVMs*, consisted of an inquiry to determine which of several visual markers signifying interrogation and negation would be considered most effective as syntax clues by different types of hearing-impaired populations. The results of the study indicate that students selected AVM icons closely related to their primary mode of communication. The AVM icon used in *The Yes-No Game* treatment materials was the one chosen by the majority of students most like subjects in the main phase of this study.

The main experiment dealt with the effectiveness of computer assisted remedial instruction for the Deaf in the area of formation of yes-no questions in English. The study was carried out in two stages: the first dealing with questions involving *BE* as a main and auxiliary verb, and the second involving the auxiliaries *DO, DOES,* and *DID*. Both phases of the experiment utilized specifically produced CAI material for treatment and control groups (*The Yes-No Game I and II*), specifically produced tests, and error analysis of materials produced by students in the test situation. The treatment material that was devised made optimal use of ASL visualization techniques and simultaneity of expression — made possible by the use of the Macintosh computer. The tests consisted of two parts: Part I involved recognition of correct grammatical structures in a multiple choice format, and Part II required cued production of specific questions.

The first experiment used a simple pre- post design and included, in addition to the CAI treatment, the use of a distinct Advanced Visual Marker (icon), and the students' reading comprehension scores as independent variables in the evaluation of the experiment. The results showed clearly that the CAI treatment contributed significantly to gains from pre- to post test; the use of the AVM icon, however, did not contribute significantly. Reading scores contributed significantly only in Part II of the test.

The second experiment also involved an experiment and control group, but three test administrations. Before the second test administration, only the experimental group received the treatment. Between the second and third administration, the treatment was also given to the control group. The independent variables used in the analysis were the CAI treatment and reading scores; the use of the AVM icon, which had not proved significant in the first experiment, was dropped from the treatment and analysis in the second experiment. Analysis of the test scores showed that again reading scores had no influence on Part I of the test but did significantly influence outcomes in Part II. As a result of the intervention, both treatment and control groups made modest, but near significant gains in Part I of the test. In Part II the reading scores related significantly to gains made on the test, but the intervention had no demonstrable effect on the gains except in the third administration of the test to the original group — turned control group — which realized a near significant gain.

In both experiment I and II, an error analysis of the actual sentences produced on Part II of the tests was undertaken. While no statistical tests of significance were applied to error frequencies, overall patterning of frequencies corresponded to the statistical analysis of the test scores. Improvement in the incidence of errors specifically related to the problems treated in the interventions was clearly shown in the relevant error categories in the first experiment. In the second experiment no such pattern in the frequencies of certain error types seemed to occur. The error analysis also showed that in conjunction with question formation, certain error types not included in the treatment (e.g., confusion in expressing the subject addressed in thee question) could be considered in future treatments to be devised.

Statement of Conclusions

Effecting a change in language behavior that has become ingrained is a difficult, complex, and time consuming task. As evidenced by the documented results of our interventions, however, it appears that our CAI approach has substantial potential for accelerating the acquisition of English syntactic knowledge by deaf students.

Although our instructional interventions focused on yes-no question formation, the effectiveness of this approach suggests the desirability of building a complete CAI syntax curriculum based on visualization techniques as linguistic bridges from ASL to English syntactic structures. Visualization and simultaneity of expression in well designed CAI may be particularly important to basic concepts in the education of the Deaf; these aspects can build on certain strengths of the Deaf that are not utilized in standard teaching materials — those that are visual and spatial like ASL, rather than linear and sequential like English. As a result, the difficulty of making grammatically correct judgements (as evaluated on Part I of the tests we administered), and the distinctive, ungrammatical deaf syntactic structures that have persisted in spite of years of schooling (as studied in Part II), may be ameliorated. Programs such as *The Yes-No Game* may enable deaf students to proceed through three phases of language learning with more facility: (1) recognition (correctly judging grammaticality), (2) learning rules for production in a test situation, and (3) acquisition of generative rules (evidenced by spontaneous, correct use in real life communication). The results of *The Yes-No Game* indicate a potential breakthrough in the heretofore intractable problems of deaf students to master English syntactic structures.

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APPENDIX 1

"The Effectiveness of CAI for the Hearing Impaired"

This paper, which was published in the Proceedings of the 30th International ADCIS Conference, received Honorable Mention for the 1988 ADCIS Best Paper Award.

The Effectiveness of CAI Designed for the Hearing-Impaired

Nancy S. Fogel

The American Institutes for Research

Abstract

Two pilot studies were designed to determine the effectiveness of linguistically controlled, highly visual computer-assisted instruction (CAI) for hearing-impaired high school students. Study 1, "Using Articles," evaluated a CAI intervention developed in IBM Logo. Our data suggested that state-of-the-art CAI, designed specifically for this population, improved the students' ability to use articles with count nouns. This study also attempted to discover whether or not there were differences in the effectiveness of this CAI approach for three specific populations: (1) students whose primary mode of communication was American Sign Language (ASL), (2)students who signed exact English (SEE II),and (3) students who communicated orally.

Study 2, "Choosing Advanced Visual Markers (AVMs)," was the first investigation in a series of instructional interventions to determine the efficacy of using icons (AVMs) in CAI to teach English syntax to hearing-impaired high school students. Created using HyperCard on the Macintosh, the AVMs were designed to communicate the essence of a syntactical structure to be taught, e.g. a negative or interrogative pattern. "Choosing AVMs" evaluated the responses of four high school populations to eight different icon designs. In an interactive program the students were asked to rank the alternative AVMs that connoted "negation" or "interrogation." As in "Using Articles," this study used three hearing-impaired populations to determine whether or not there were differences in the ranking of the icons by students with different, primary modes of communication. Preliminary findings suggested that students chose AVMs which were closely related to their language background. Those exposed to ASL selected AVMs which reflected the facial expression of a native ASL signer, while those who communicated orally selected the universal symbols found in English texts.

Introduction

The formidable difficulties that the deaf experience in learning English are reflected in the large numbers of functionally illiterate deaf adults. Instructional methods to date have not effectively developed the ability of the deaf to read and write English sufficiently. On the average deaf adults reach only a fourth grade reading level, and only 10% of the best 18 year-old deaf students read at or above the eighth grade level. Now, however, as an outgrowth of the seminal studies by Noam Chomsky in the late 1960's, the revolution in linguistic thinking has extended to studies of language and commmunication of the deaf. The pioneering work of William Stokoe (1960, 1975), followed by Bellugi (1972, Klima and Bellugi,1979), Newport (1977), Siple (1978), and Lane and Grojean (1980), firmly established American Sign language (ASL) as a "natural" language. Where English is a natural aural-oral language, ASL is a visual-gestural language which evolved to meet the specific communication needs of the deaf. Building upon ASL conceptualizations, the deaf may be able to acquire the linguistic structures with which they experience difficulty in English but which they acquire with facility in ASL.

In addition, the availability of new computer technology, which can be used for instruction, may remove many of the limitations with which educators and researchers have struggled. While hearing children enter school with a fairly complete knowledge of the syntax and lexicon of the English language, hearing-impaired students must simultaneously learn the language, and learn how to read and write that language. Without ever having heard English, students are expected to replicate the lexicon and syntax. Microcomputer-based language programs, however, may offer a way to capitalize on the prior language-related, visual knowledge that the hearing-impaired acquire in learning sign. Where English uses time and sequence, the computer courseware designer can use the ASL dimensions of position and motion in space to enhance language learning. Even though ASL functions in a visual-motor modality and English operates in an auditory-vocal modality, educational software may offer hearing-impaired students more rewarding opportunites for interactive, language experience than they usually experience. Maximizing the ASL aspects of visualization and simultaneity of expression, computer-assisted English language programs can use color, graphics, and windows to highlight and emphasize instructional points and informational feedback. Through CAI designed specifically for the hearing-impaired, a student may be motivated to interact with a rich language environment in which the syntax, vocabulary, and figurative language are linguistically controlled and incrementally graduated in terms of difficulty for hearing-impaired learners; language acquisition and usage can proceed at the learner's own pace. This paper reports the results of two related studies which were designed to ascertain the effectiveness of CAI created specifically for hearing-impaired students.

Study 1: "Using Articles"

Programmed in IBM Logo to run on an IBM-PC with 256K, "Using Articles" was a preliminary investigation of the potential of CAI for effective instruction of English syntax with hearing-impaired students. The computer program was field-tested to answer two basic questions: First, can state-of-the-art educational software improve the ability of hearing-impaired learners to use articles with count nouns? Second, will there be differences in the effectiveness of this CAI approach for the three different hearing-impaired populations?

Sample

Three hearing-impaired high school populations comprised the study sample for "Using Articles":

1. Ten "Oral-only" students, ages 14 to 18, were in a day program for the communicatively handicapped Oral-only indicates that the students' first language is English and that they communicate in an aural-oral mode.
2. Ten "Total Communication" students, ages 14 to 19, used SEE II and speech in a day program. SEE II, Signing Exact English, is a type of Manually-Coded English.
3. Nine "Total Communication" students, ages 14 to 16, were enrolled in a residential program, which used ASL or PSE (Pidgin-Signed-English) as their language of choice for personal communication.

Methodology

The program, "Using Articles," was limited to three lessons which could be completed by an average subject in approximately one hour. The lessons consisted of exercises and paragraphs which focused on:

1. choosing the article a or an
2. using a, an, and the null article (Ø) with singular and plural count nouns; for example, "balls" are "countable" while "air" is not. The null article indicates the lack of an article preceding plural count nouns; for example, he eats an apple every day, but he never eats 0 pears.
3. using a, an, the, and the null article (Ø) in first and second mention. The first time a noun is mentioned, an indefinite article is used, but the second mention requires a definite article; for example, I found a key. Is it the key to your car?

At each of the three test sites, the goals of the program were explained and the students' support was elicited. After pencil-and-paper pre-tests were administered to each group, students proceeded through "Using Articles" individually; the learner controlled the pace. Within 24 hours of using the program, a post-test was administered. The format, level, and administration of the pre- and post-tests were comparable. The syntactical structures of the sentences in the pre- and post-tests were identical, but the nouns and verbs were different.

Results

Figure 1 reports the pre- and post-test scores of each group. Repeated Measures Analysis of Variance (ANOVA) showed that the three groups demonstrated improvement in all three topics. All pre-post-test differences were significant ($p < .05$).

1. A and An — Although significant, the slight improvement between 0 and 1 errors indicates a likely ceiling effect. The three groups seem not to have needed instruction on this topic.
2. Singular and Plural — As in the case of "A and An," the Oral-only group seems not to have needed this lesson. As demonstrated by the number of mistakes on the pre-test, the SEE II and ASL groups needed and benefited from this lesson. Eight of the nine ASL students, and the ten SEE II students demonstrated improvement. Considering the brevity of the exposure — only one hour of intervention — it is surprising to see such a significant degree of improvement within these two samples.
3. First and Second Mention — The number of errors in the pre-test indicates that all three groups needed and benefited from instruction on this topic. Usually, hearing-impaired students with the most language make the most progress; however, in this difficult lesson the rate of improvement appears equally high for all three groups. The ASL and SEE II groups improved at a rate equal to their performance in the "Singular and Plural" lesson. However, the graph displaying this result masks substantial variance in the individual performances: more than half the students displayed strong and steady progress, one quarter (mostly from the Oral-only group) did not seem to need the instruction, and the other quarter did not benefit from the instruction. The mixed results from this most difficult lesson, "First and Second Mention," may be attributed in part to a need for more practice. Because there was a fixed amount of practice (one hour) across all three topics, one can speculate that additional practice in the more difficult areas would lead to an increase in learning.

Considering the usual slow rate of improvement of syntactic structures among the hearing-impaired (Quigley, 1978), the encouraging findings from this carefully designed CAI intervention of short duration motivated us to study other aspects of ASL which could be transferred to an advanced computer technology. Our investigation led us to HyperCard on the Macintosh, which combines the ease of use associated with a graphic interface with the power of an object-oriented programming language. Critical components of our instructional approach, graphics and animation, are handled with facility and speed in HyperCard; presentation of the instructional design is delievered with appropriate speed on the Macintosh.

Study 2: "Choosing AVMs"

Programmed in HyperCard to run on a Macintosh, "Choosing AVMs" (Advanced Visual Markers) was the first investigation in a series of instructional interventions to determine the efficacy of using icons (AVMs) to teach English syntax to hearing-impaired students. (See the Icon Key in Figures 2 and 3.) In English the grammatical element that distinguishes a declarative sentence from an interrogative or negative one is syntax, i.e. word order; however, in ASL the grammatical signals that indicate sentence type are the signer's facial, eye and head behaviors. These highly visual, non-manual behaviors are produced concurrently with all the ASL signs for the concepts and words in the sentence (Baker, 1980).

To capitalize on ASL's visualization and simultaneity of expression in teaching English, we created AVMs (icons).to provide learners with a visual clue, or bridge. The AVMs were designed to denote the English language requirement for a transformation, a change in word order, when writing a negative sentence or question in English.

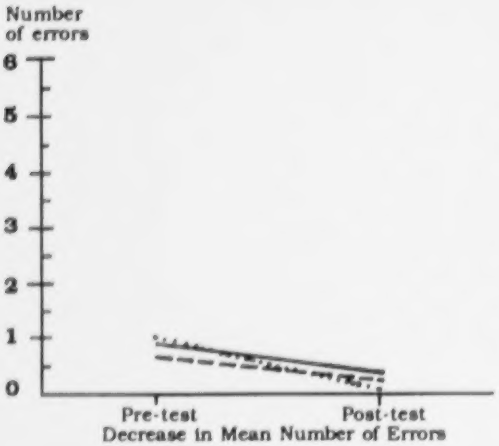
The first major step in developing instructional materials built around AVMs was to decide upon the optimal style of icon. We designed eight AVMs (icons): four for negation and four for interrogation. The AVMs ranged from abstract symbols to line drawings to the digitized photographs of a native ASL signer's facial expression when asking a yes-no question or expressing negation. Figures 2 and 3 display the negative and interrogative AVMs that were used in this pilot study.

"Choosing AVMs" was designed to evaluate the responses of four high school populations to eight different AVM designs. In an interactive program the students were asked to rank the alternative AVMs that connoted "negation" or "interrogation." The study sought to determine the answers to two basic questions. First, would one AVM emerge as the dominant choice across all student populations? Second, would students choose AVMs which were closely related to their language background? For example,

Lesson 1: A and N

Group	n	Pre-test		Post-test	
		mean	s.d.	mean	s.d.
ASL-speech	9	0.9	1.27	0.4	0.73
SEE II-speech	10	0.6	0.84	0.2	0.42
Oral-only	10	1	1.56	0.1	0.32

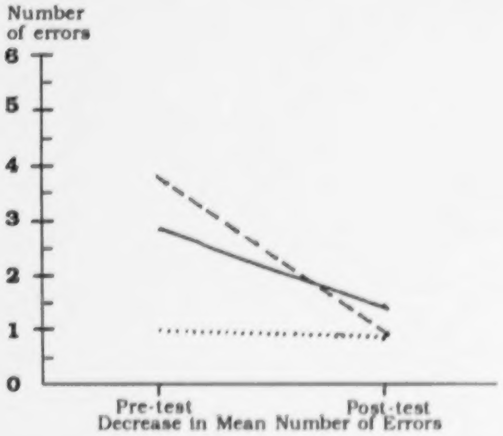
Mean Scores on Pre and Post-tests



Lesson 2: Singular and Plural

Group	n	Pre-test		Post-test	
		mean	s.d.	mean	s.d.
ASL-speech	9	2.8	1.72	0.9	0.78
SEE II-speech	10	3.7	1.83	1.3	1.34
Oral-only	10	0.9	1.29	0.8	1.32

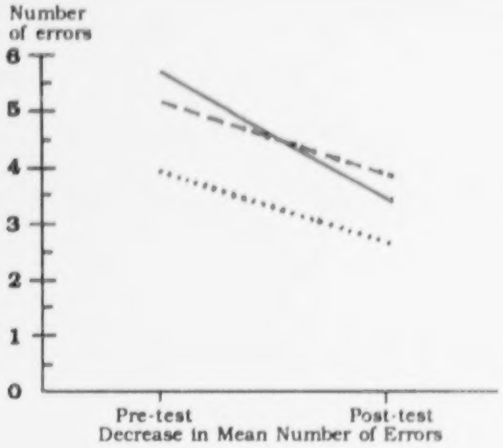
Mean Scores on Pre and Post-tests



Lesson 3: First and Second Mention

Group	n	Pre-test		Post-test	
		mean	s.d.	mean	s.d.
ASL-speech	9	5.6	1.51	3.4	2.01
SEE II-speech	10	5.1	2.08	3.8	1.87
Oral-only	10	3.9	3.04	2.6	2.01

Mean Scores on Pre and Post-tests



Key
——— ASL-speech (Residential)
– – – – SEE II-speech (Day Class)
·········· Oral-only (Day Class)

Figure 1. Mean Scores on Pre and Post-tests and Decrease in Mean Number of Errors for Three CAI Lessons

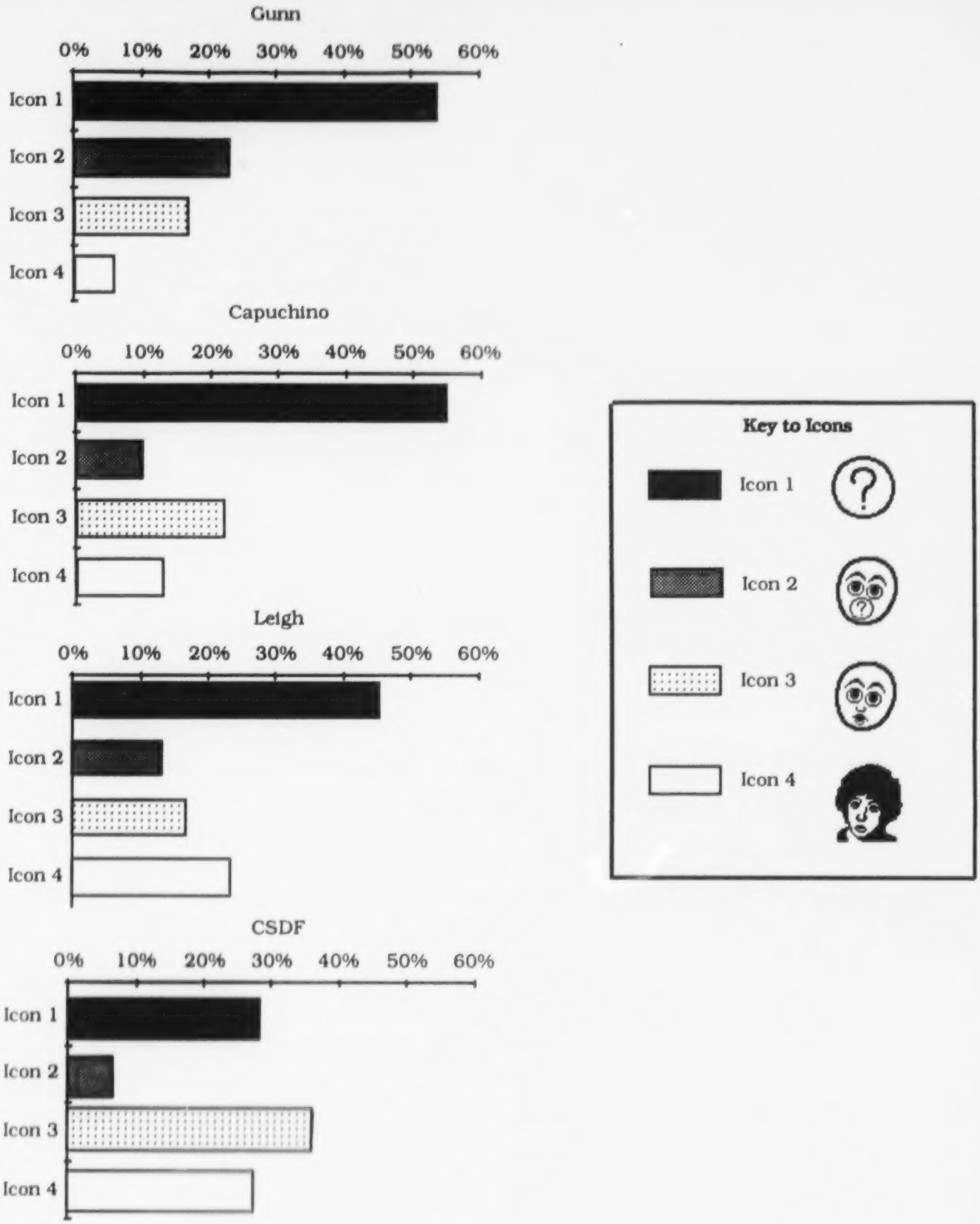


Figure 2. Percentage Ranking of Interrogative Icons by School Site

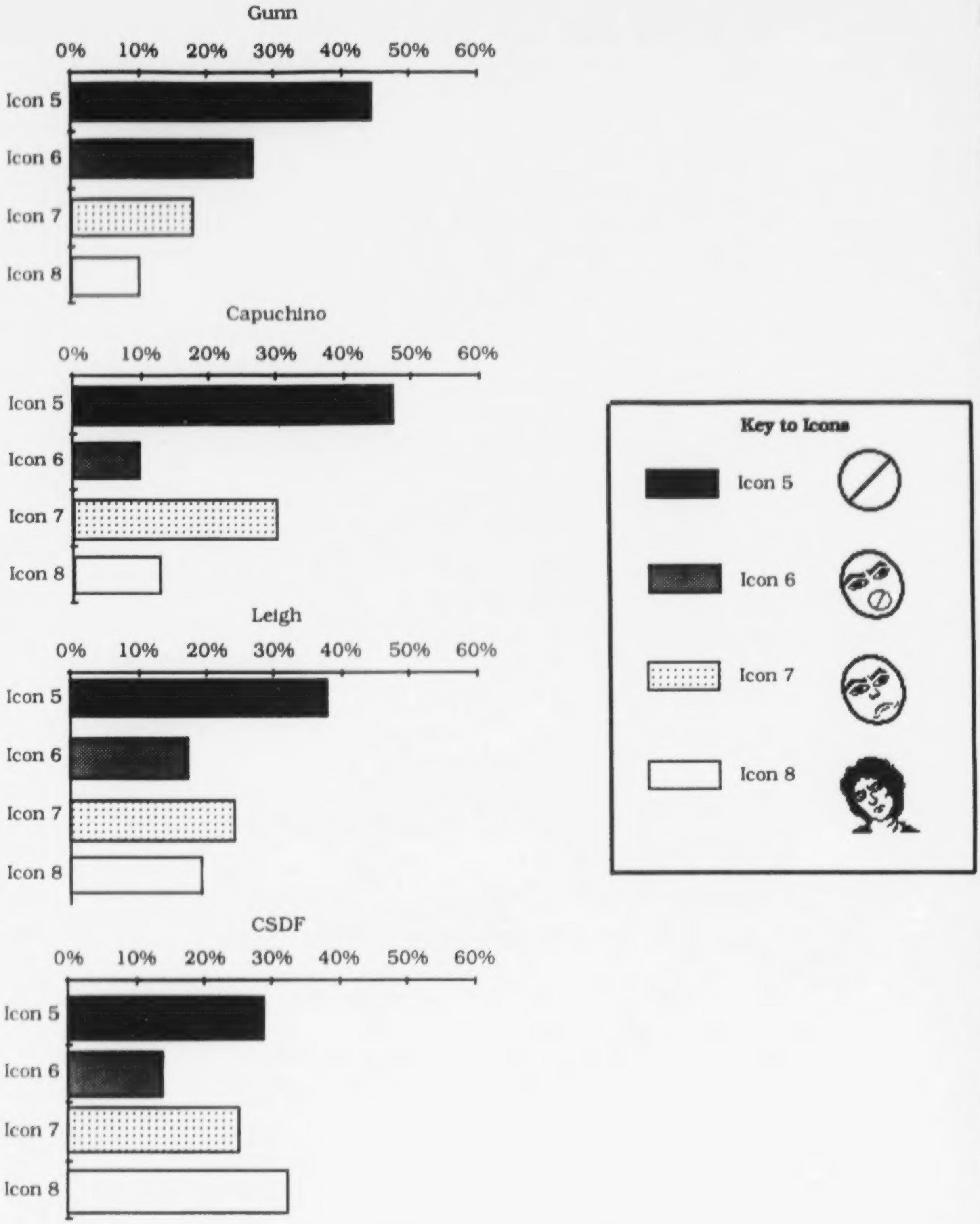


Figure 3. Percentage Ranking of Negative Icons by School Site

would students with exposure to ASL tend to choose Icons 4 and 3 for interrogation and 8 and 7 for negation because those AVMs were derived from the digitized image of a native ASL signer's facial expressions? In contrast, would the more aural-oral, mainstreamed students select the universal, textbook symbols in Icons 1 and 2 for interrogation, and Icons 5 and 6 for negation?

Sample

The sample for "Choosing AVMs" was drawn from four secondary school, hearing-impaired populations to determine whether or not there were differences in the ranking of the icons by students with different, primary modes of communication:

1. Twelve "Oral-only" students, ages 14 to 18, were in a day program for the communicatively handicapped.at Gunn High.
2. Twenty-five "Total Communication" students, ages 14 to 19, used SEE II and PSE with speech in a day program at Leigh High.
3. Thirteen "Total Communication" students, ages 14 to 19, used SEE II, PSE, some ASL, and speech in a day program at Capuchino High.
4. Twenty-one "Total Communication" students, ages 14 to 19, used PSE and ASL with some speech in a residential program at the California School for the Deaf in Fremont (CSDF).

Methodology

To collect data about the AVMs (icons), we developed "Choosing AVMs" an interactive program in which 71 hearing-impaired students in four school settings assisted in designing their own instructional material by indicating their preferences for the AVMs currently under consideration. At each of the four test sites, the goals of the program were explained and the students' support was elicited. Each student proceeded through "Choosing AVMs" individually; the student controlled the pace. Following several interactive screens that explained the Macintosh interface, "Choosing AVMs" displayed eight sentences with corresponding pictures. Each sentence-picture combination was displayed with each of the four appropriate AVMs, for negation or interrogation. The presentation order of the AVMs was randomized but did not include the possibility of the AVMs being presented as a continuum from abstract to concrete or vice-versa. After each sentence-picture-AVM display, the students were asked to rank the four AVMs according to the following criterion: which AVM best captured the essence of negation — or interrogation — for that sentence-picture? Data were collected on the presentation order and the ranked responses.

Results

Figures 2 and 3 show the students' percentage rankings of their choices of interrogative and negative AVMs respectively. Let us first describe the students' first choices by school, and then turn to differences across all choices by school.

The solid black bars on the histograms in Figure 2 show a consistent preference for Icon 1 — the most abstract, interrogative AVM — for all schools except CSDF. A plausible explanation for the difference in preference between students at CSDF and the other three sites could be that the students at CSDF have been exposed to and used sign language as a primary mode of communication. Because facial expressions tend to be incorporated as key syntactical elements in sign language, the AVMs derived from ASL facial expressions would be more familiar to these learners.

In contrast, because students at the other three sites have been mainstreamed for a number of years, their language experiences tend to resemble those of hearing populations. As a result, their AVM preferences would be more closely related to the abstract punctuation symbols more familiar to learners sharing conventional, English language instruction.

Looking beyond first preferences, of particular note is the pattern of responses displayed in Figure 2. While Gunn students showed a progressively decreasing interest in icons along the abstract to concrete continuum, with only 23% choosing interrogative Icons 3 and 4, the CSDF students displayed a strong interest in the more concrete ASL-like respresentations; 65% selected Icons 3 and 4. Again, this preference is likely a reflection of the CSDF students' visual mode of learning and exposure to ASL. As a result, their preferences for Icons 3 and 4, the line drawing and the digitized photographic image of a native ASL signer using the facial expression for a yes-no question, are quite understandable. In contrast, the Gunn students' primary mode of communication is aural-oral English, with little or no exposure to ASL.

The responses displayed in Figure 3 show a pattern similar to Figure 2. Only 29% of the Gunn students expressed an interest in the ASL AVMs, Icons 7 and 8. In contrast, 58% of the CSDF students selected Icons 7 and 8. To deaf students, like those at CSDF who heavily rely on visualization, facial, eye and head behavior play a dominant role in their communication. Yet over all schools, the pattern of preferred icons was not as consistent for negative sentences as it was for interrogative. Capuchino students, like those at CSD, showed a preference for an AVM other than the most abstract. Further analysis of this data may reveal more about the underlying causes for these response patterns.

Educational Importance of Studies 1 and 2

The data from these preliminary studies are encouraging. The results of "Using Articles" suggest that state-of-the-art, computer-assisted language instruction may be of benefit for all three populations studied. Although secondary school hearing-impaired students may not need direct instruction or intensive review of "A and An," most are likely to require work in the areas of "Singular and Plural" and "First and Second Mention." Where needs are demonstrated, innovative CAI, even of a relatively short duration, has powerful effects. The fact that pre-post gains were similar for all three groups suggests that such programs may enable all hearing-impaired students to improve their English regardless of the degree of their hearing loss.

Students participating in "Choosing AVMs" responded positively to the opportunity to participate in the design of their own instructional material. Although the AVM preferences among the four school sites were significantly different, the study revealed interesting differences within each school population. Rather than assign a dominant AVM to all students at a given school site, the program can be designed to allow individual students to select whichever AVM best reflects their individual preferences. In fact, students could select different AVMs as they proceeded through the instructional series.

Even though these studies indicate the positive effect of linguistically controlled, highly visual CAI for hearing-impaired students, the studies leave a number of areas to investigate. The next step in our research will be the development of "Using AVMs." In order to link the English syntactical structure to a visual ASL construct, we will pair the AVM with the English structure; computer animation will be used to maximize the transfer of relevant knowledge. Multiple opportunities for initiating interactive practice will be provided. As the learner becomes proficient, the AVM will fade, enabling the hearing-impaired learner to become familiar with typical presentations of English syntax. If a student's performance begins to decline, the icon will reappear.

"Using AVMs" will incorporate a series of studies of two syntactical structures: negation and interrogation. Each study will be a contolled experiment involving the formation of treatment and conrol groups with random assignment of subjects to groups. The experiments will all be tests of the null hypothesis. We will determine whether we can reject the proposition that the use of AVMs has no effect on the amount of syntactical knowledge learned from a CAI presentation that cannot be accounted for by chance. In each study treatment and control subjects will receive almost identical treatments, the single difference being that the treatment subjects will have AVMs embedded in their CAI presentations.

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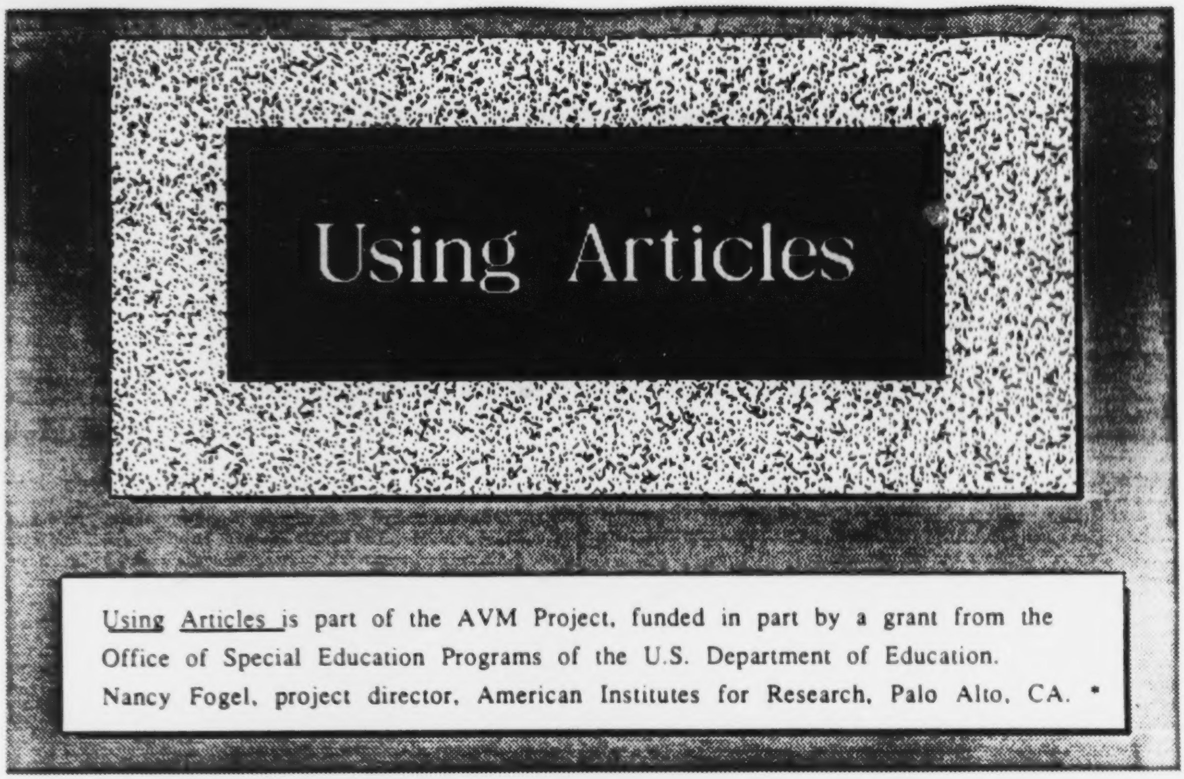
"The Effectiveness of CAI Designed for the Hearing-Impaired" was published in the Proceedings for the 30th International ADCIS (Association for the Development of Computer-Based Instructional Systems) Conference, November, 1988.

This paper received Honorable Mention for the 1988 ADCIS Best Paper Award.

APPENDIX 2

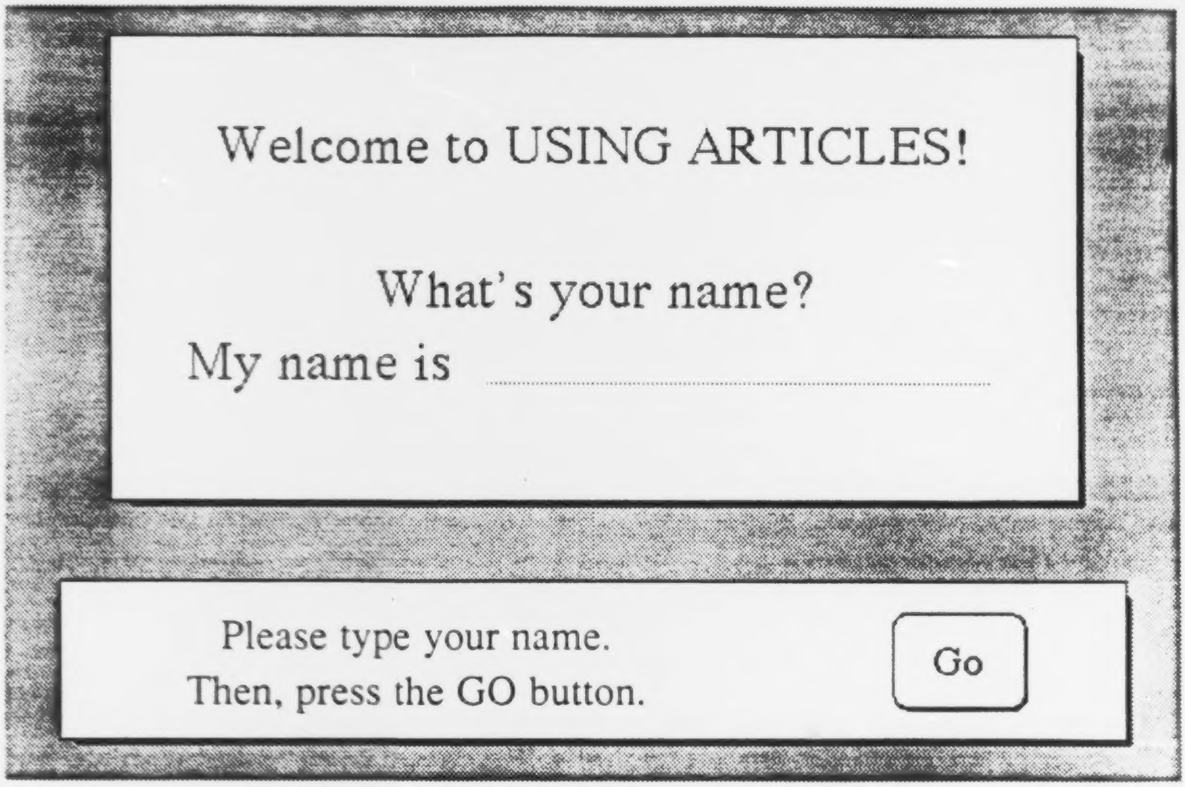
Using Articles

Sample screens of a Macintosh prototype of CAI materials for the Deaf



Using Articles

Using Articles is part of the AVM Project, funded in part by a grant from the Office of Special Education Programs of the U.S. Department of Education. Nancy Fogel, project director, American Institutes for Research, Palo Alto, CA. *

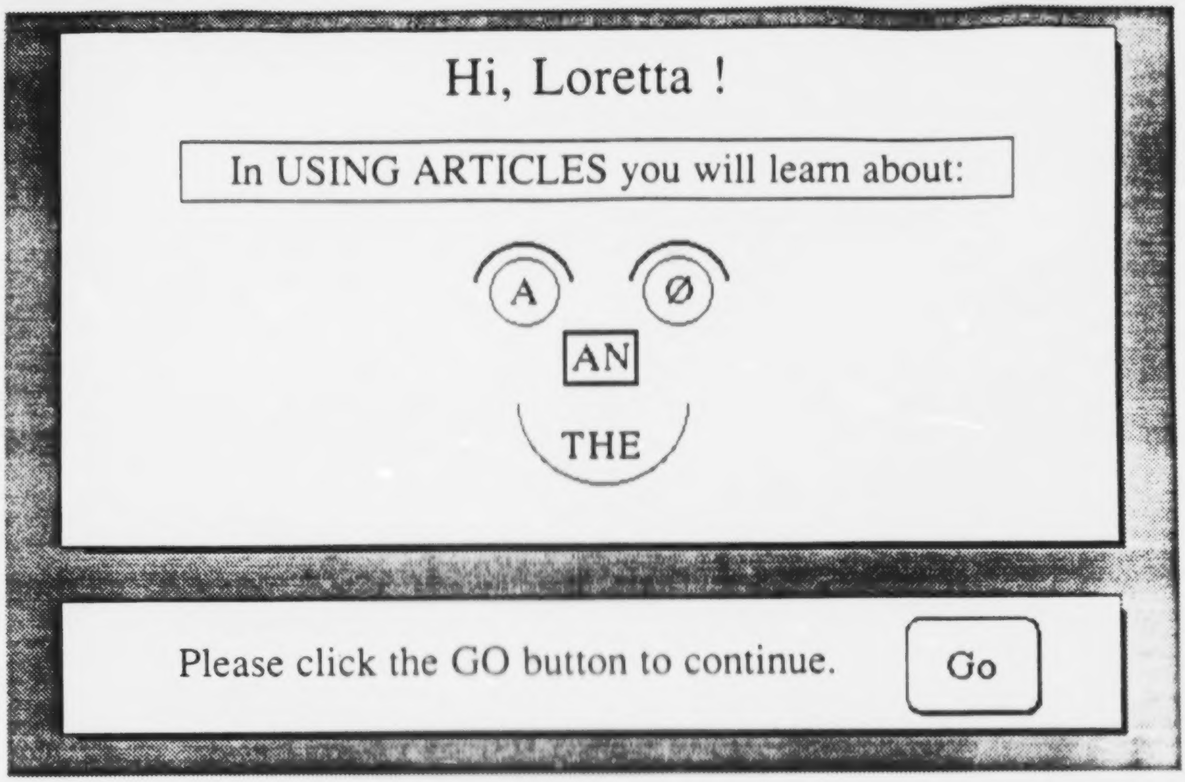


Welcome to USING ARTICLES!

What's your name?

My name is ____________

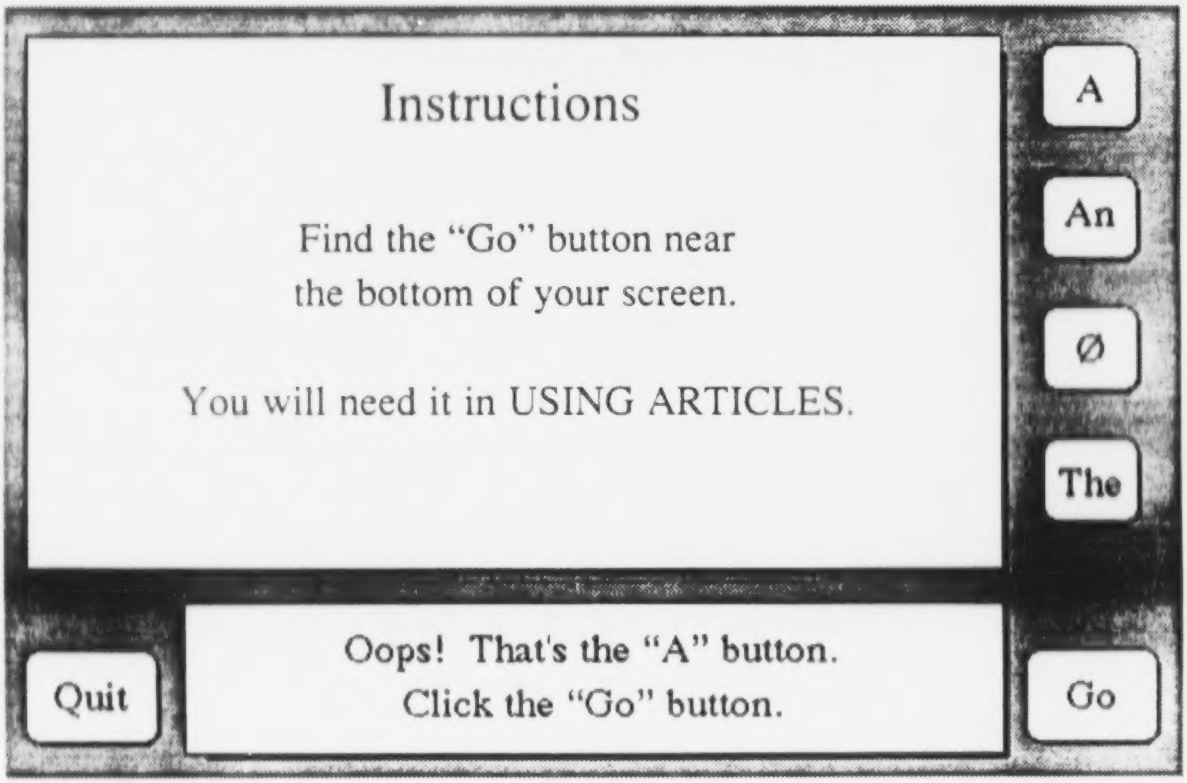
Please type your name.
Then, press the GO button.



Hi, Loretta !

In USING ARTICLES you will learn about:

Please click the GO button to continue.



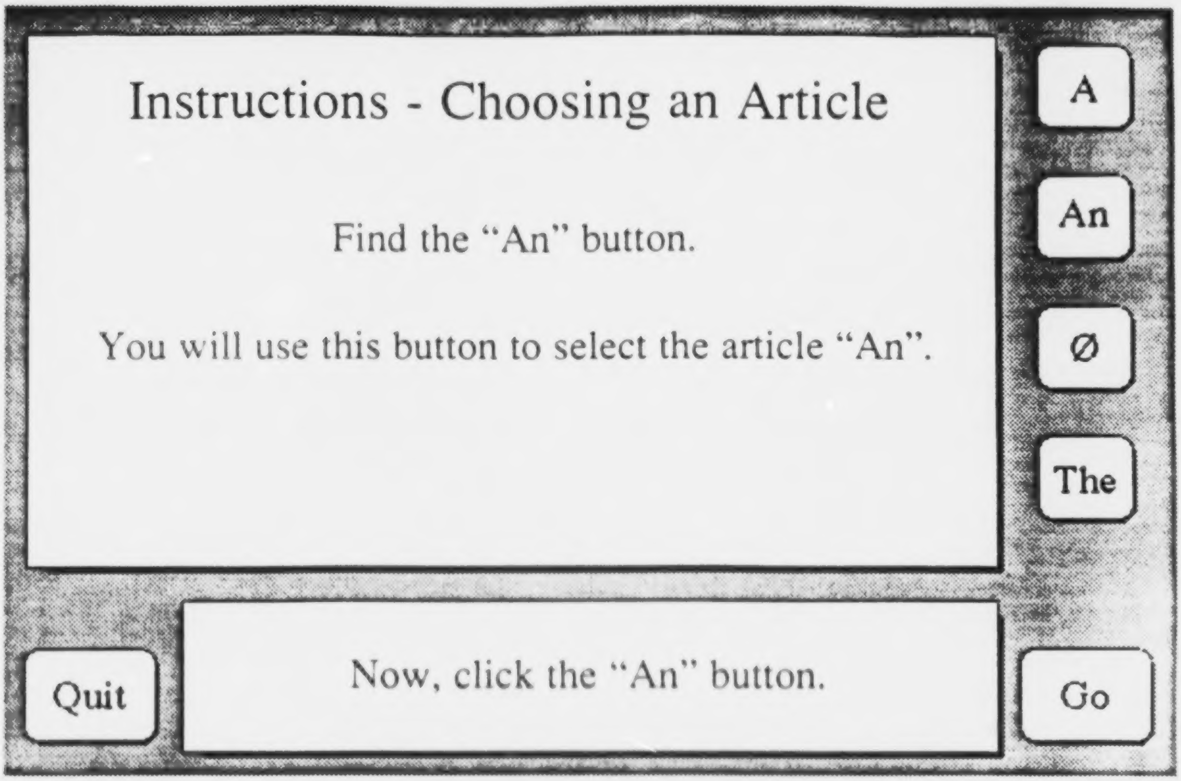
Instructions

Find the “Go” button near
the bottom of your screen.

You will need it in USING ARTICLES.

Oops! That's the “A” button.
Click the “Go” button.

A
An
Ø
The
Quit
Go

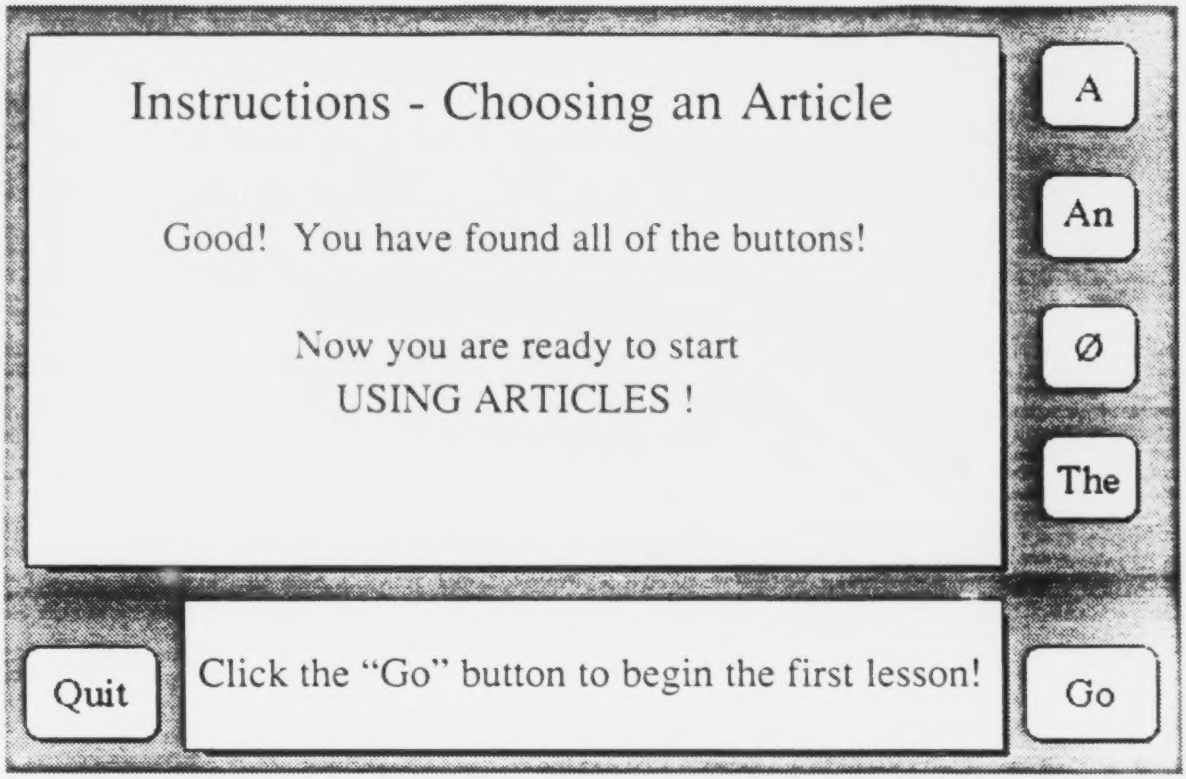


Instructions - Choosing an Article

Find the "An" button.

You will use this button to select the article "An".

Now, click the "An" button.

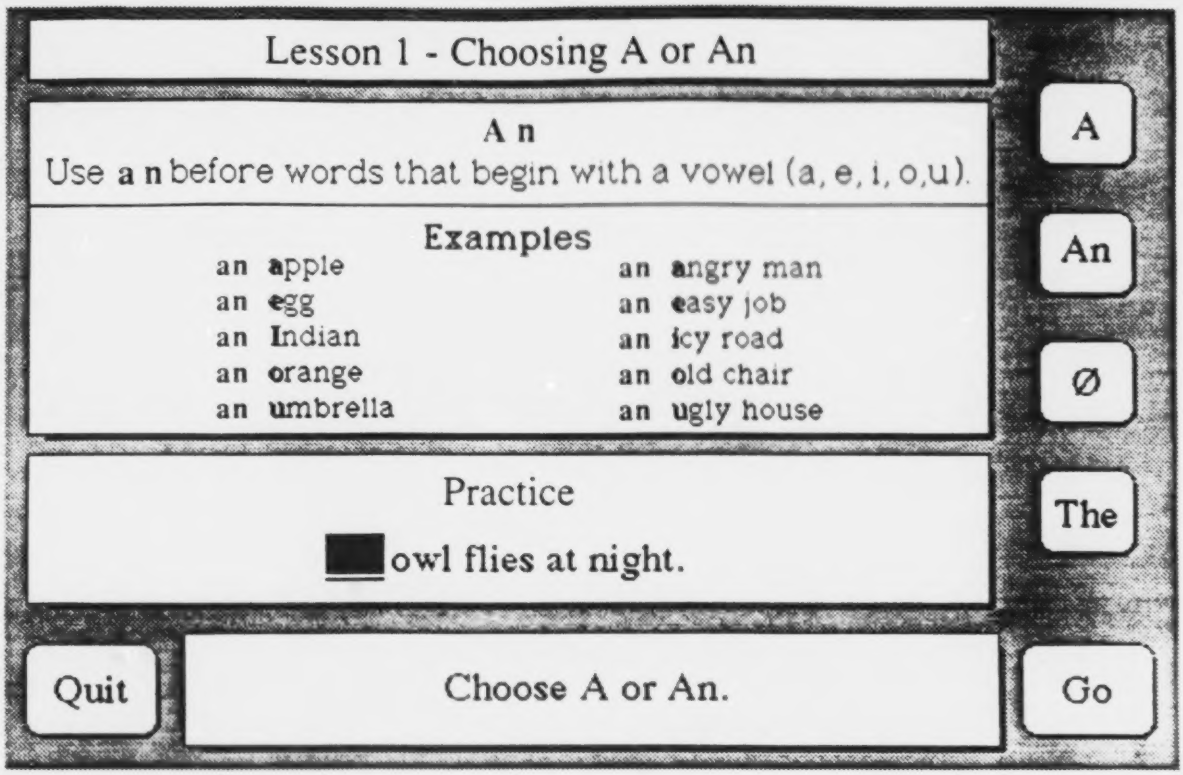


Instructions - Choosing an Article

Good! You have found all of the buttons!

Now you are ready to start
USING ARTICLES !

Click the "Go" button to begin the first lesson!



Lesson 1 - Choosing A or An

An

Use an before words that begin with a vowel (a, e, i, o,u).

Examples

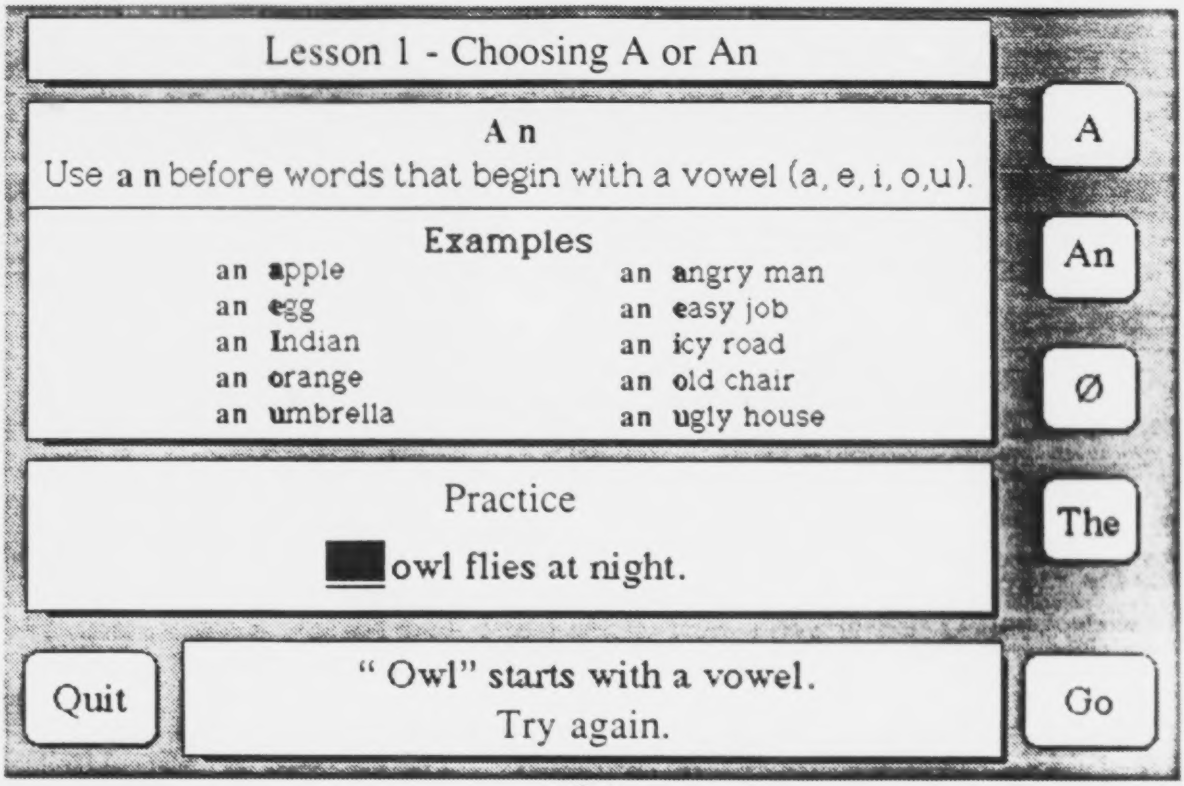
an apple
an egg
an Indian
an orange
an umbrella

an angry man
an easy job
an icy road
an old chair
an ugly house

Practice

■ owl flies at night.

Choose A or An.



Lesson 1 - Choosing A or An

An

Use an before words that begin with a vowel (a, e, i, o,u).

Examples

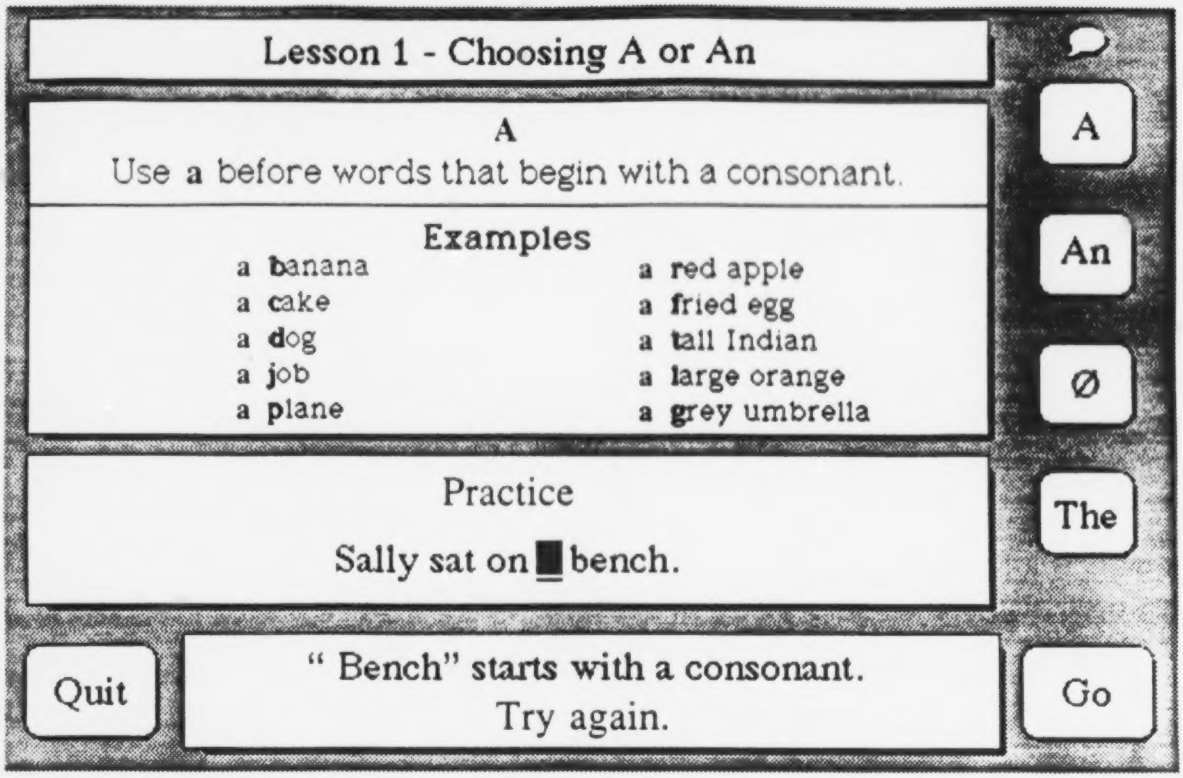
an apple
an egg
an Indian
an orange
an umbrella

an angry man
an easy job
an icy road
an old chair
an ugly house

Practice

■ owl flies at night.

" Owl" starts with a vowel.
Try again.



Lesson 1 - Choosing A or An

A

Use a before words that begin with a consonant.

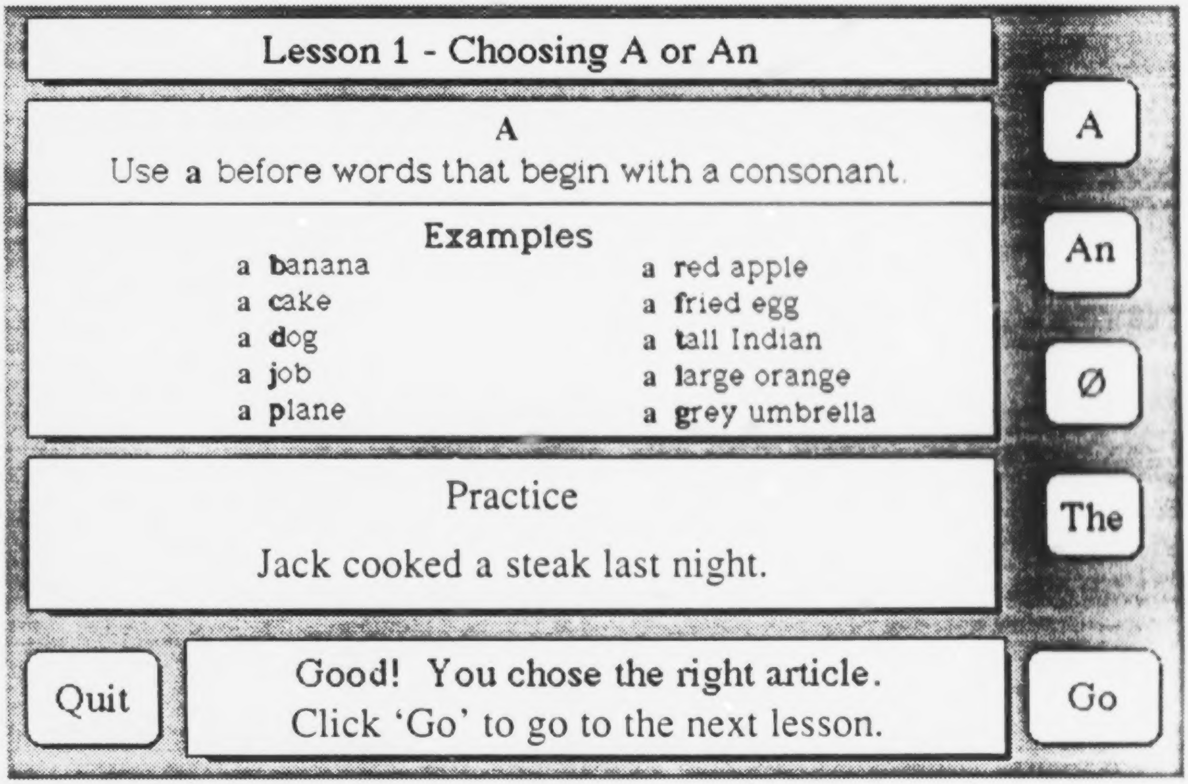
Examples

a banana	a red apple
a cake	a fried egg
a dog	a tall Indian
a job	a large orange
a plane	a grey umbrella

Practice

Sally sat on █ bench.

" Bench" starts with a consonant.
Try again.



Lesson 1 - Choosing A or An

A

Use a before words that begin with a consonant.

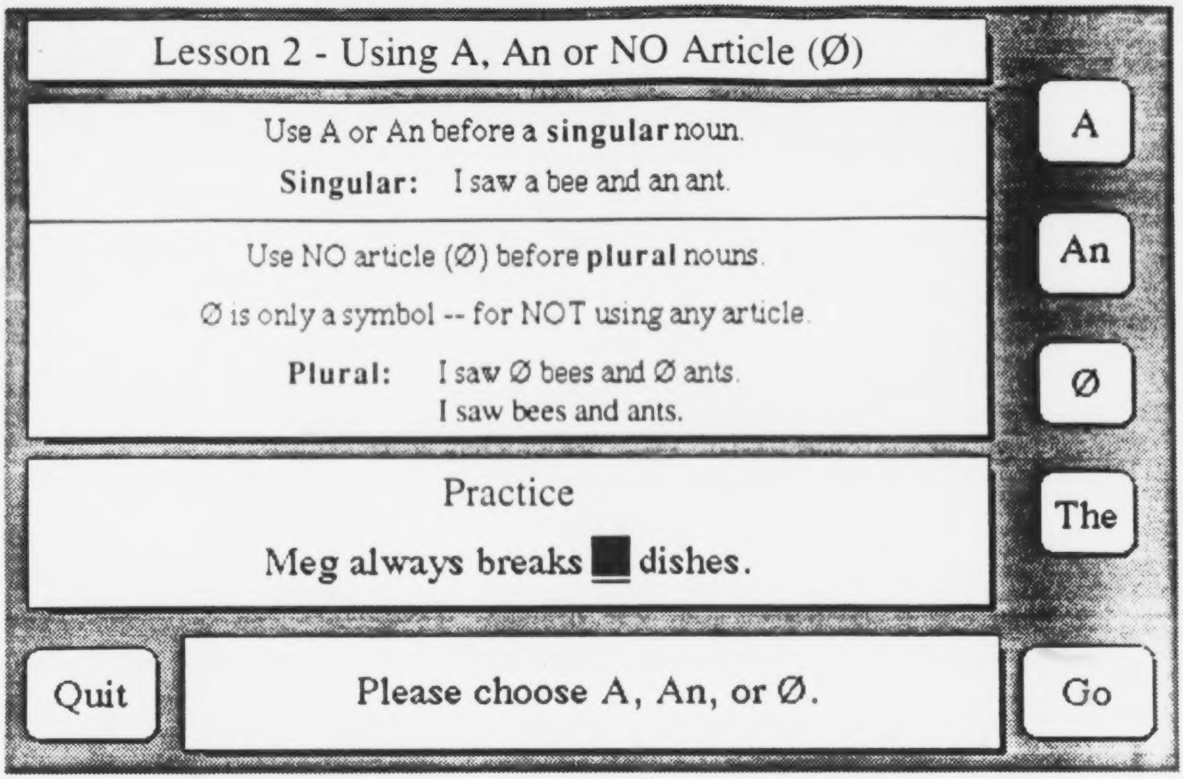
Examples

a banana	a red apple
a cake	a fried egg
a dog	a tall Indian
a job	a large orange
a plane	a grey umbrella

Practice

Jack cooked a steak last night.

Good! You chose the right article.
Click 'Go' to go to the next lesson.



Lesson 2 - Using A, An or NO Article (Ø)

Use A or An before a **singular** noun.

Singular: I saw a bee and an ant.

Use NO article (Ø) before **plural** nouns.

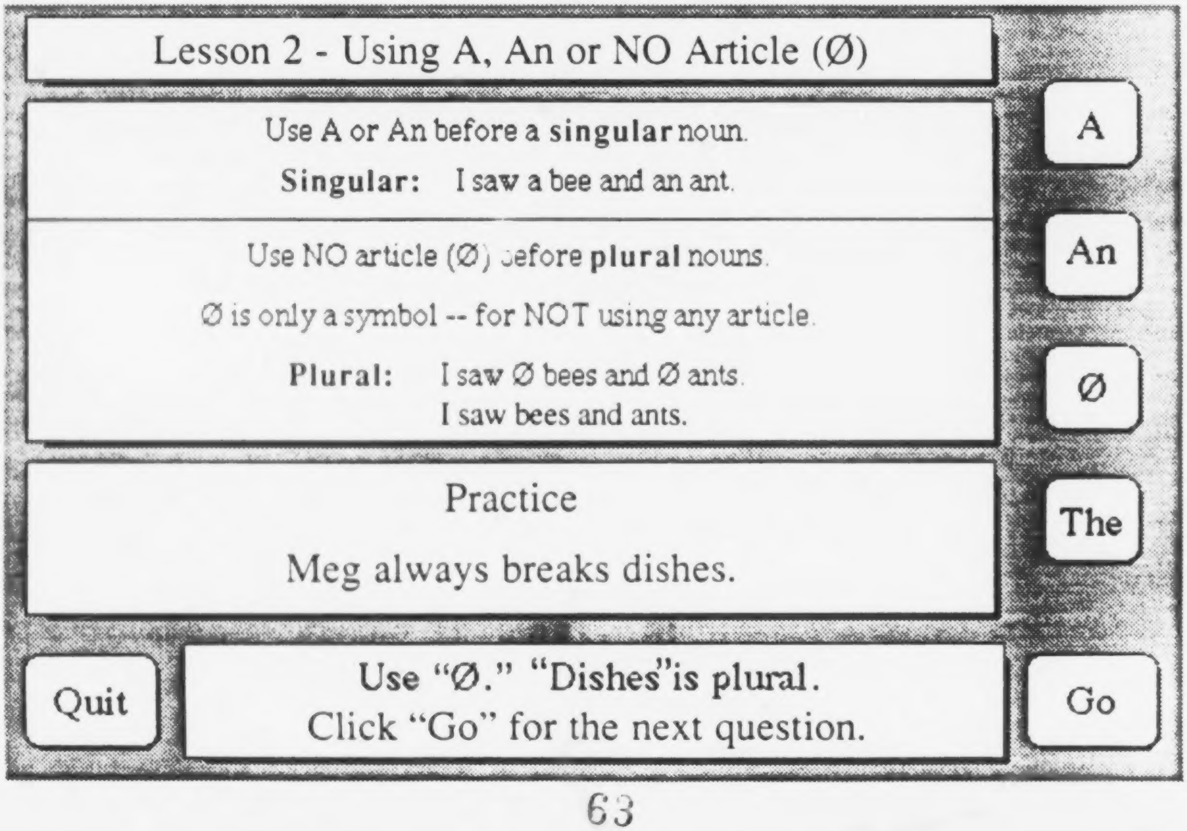
Ø is only a symbol -- for NOT using any article.

Plural: I saw Ø bees and Ø ants.
I saw bees and ants.

Practice

Meg always breaks █ dishes.

Please choose A, An, or Ø.



Lesson 2 - Using A, An or NO Article (Ø)

Use A or An before a **singular** noun.

Singular: I saw a bee and an ant.

Use NO article (Ø) before **plural** nouns.

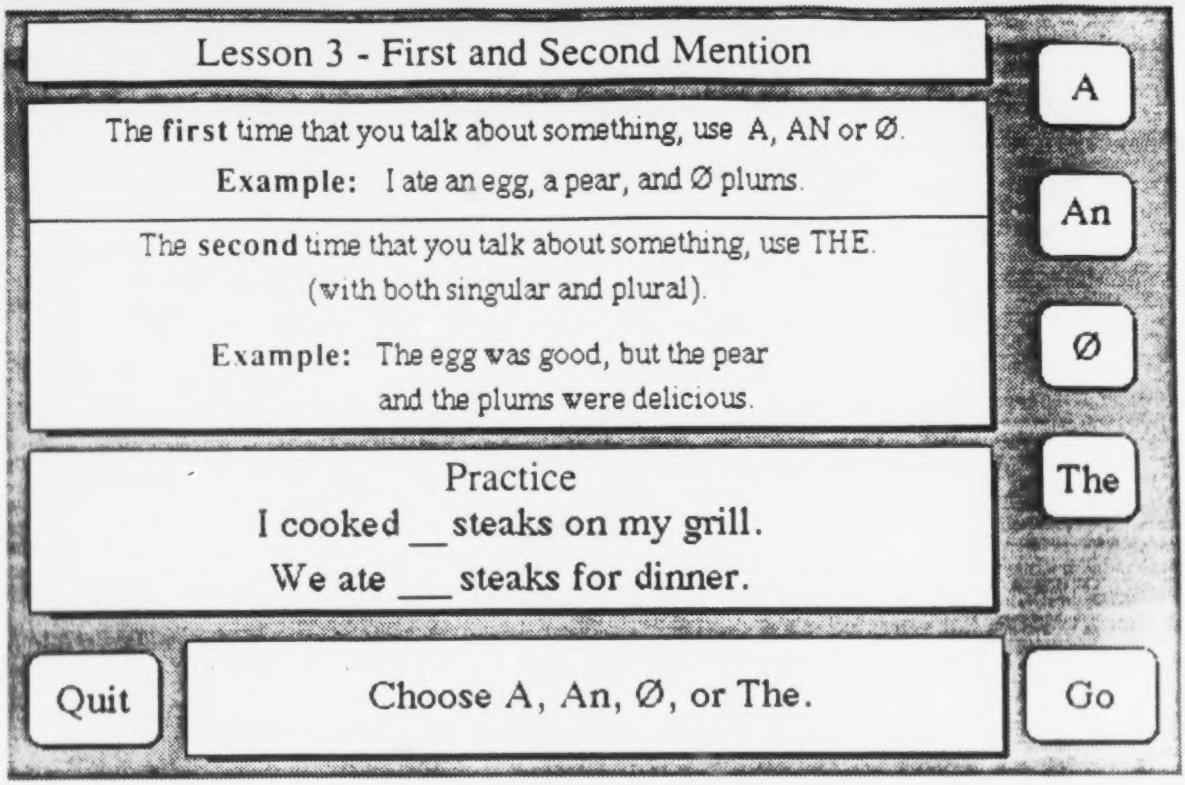
Ø is only a symbol -- for NOT using any article.

Plural: I saw Ø bees and Ø ants.
I saw bees and ants.

Practice

Meg always breaks dishes.

Use "Ø." "Dishes"is plural.
Click "Go" for the next question.



Lesson 3 - First and Second Mention

The **first** time that you talk about something, use A, AN or Ø.

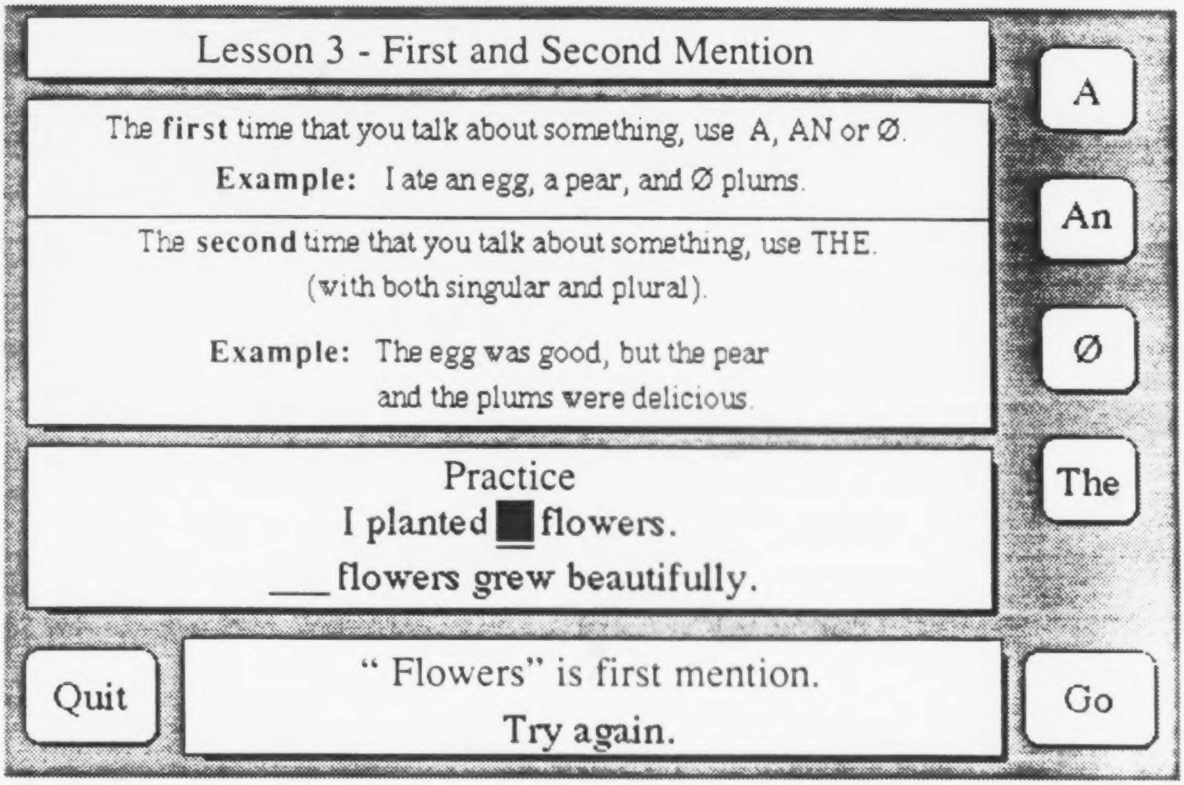
Example: I ate an egg, a pear, and Ø plums.

The **second** time that you talk about something, use THE.
(with both singular and plural).

Example: The egg was good, but the pear
and the plums were delicious.

Practice
I cooked __ steaks on my grill.
We ate ___ steaks for dinner.

Choose A, An, Ø, or The.



Lesson 3 - First and Second Mention

The **first** time that you talk about something, use A, AN or Ø.

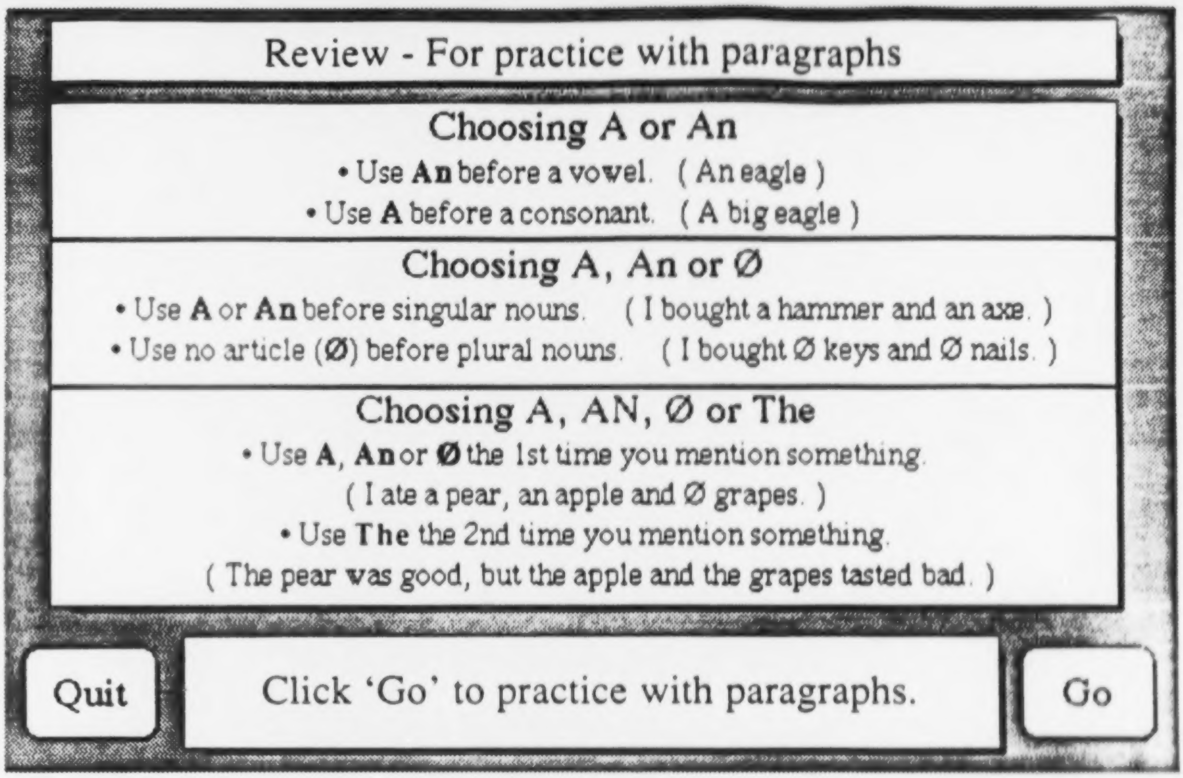
Example: I ate an egg, a pear, and Ø plums.

The **second** time that you talk about something, use THE.
(with both singular and plural).

Example: The egg was good, but the pear
and the plums were delicious.

Practice
I planted __ flowers.
___ flowers grew beautifully.

" Flowers" is first mention.
Try again.



Review - For practice with paragraphs

Choosing A or An

- Use **An** before a vowel. (An eagle)
- Use **A** before a consonant. (A big eagle)

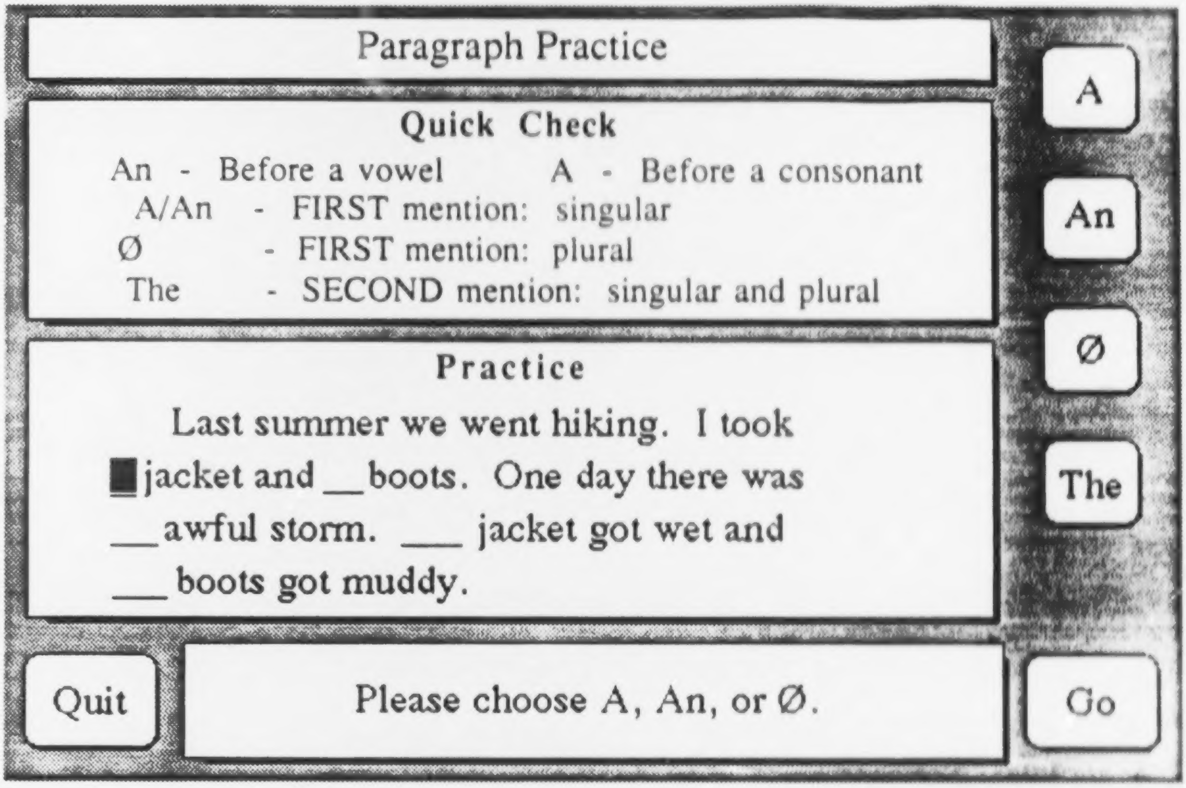
Choosing A, An or Ø

- Use **A** or **An** before singular nouns. (I bought a hammer and an axe.)
- Use no article (**Ø**) before plural nouns. (I bought Ø keys and Ø nails.)

Choosing A, AN, Ø or The

- Use **A**, **An** or **Ø** the 1st time you mention something.
  (I ate a pear, an apple and Ø grapes.)
- Use **The** the 2nd time you mention something.
  (The pear was good, but the apple and the grapes tasted bad.)

Click 'Go' to practice with paragraphs.



Paragraph Practice

Quick Check

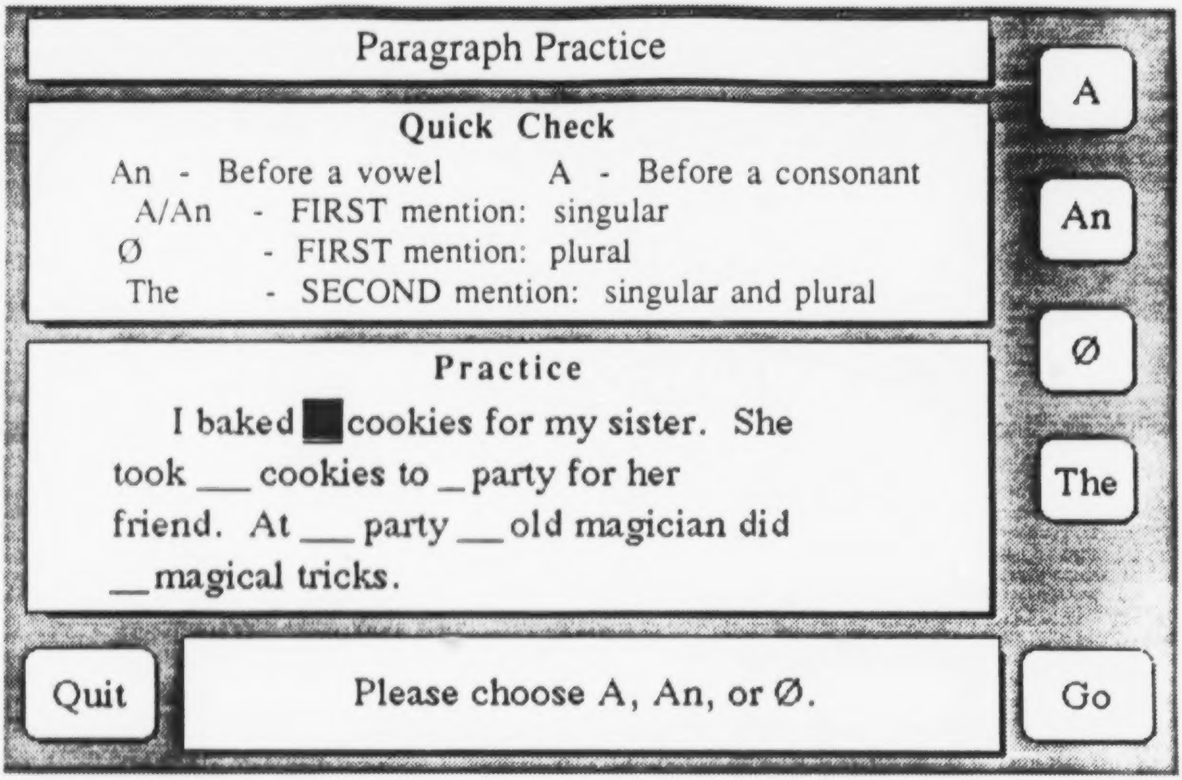
An - Before a vowel A - Before a consonant
A/An - FIRST mention: singular
Ø - FIRST mention: plural
The - SECOND mention: singular and plural

Practice

Last summer we went hiking. I took ■jacket and __boots. One day there was __awful storm. ___ jacket got wet and ___ boots got muddy.

Please choose A, An, or Ø.

BEST COPY AVAILABLE



Paragraph Practice

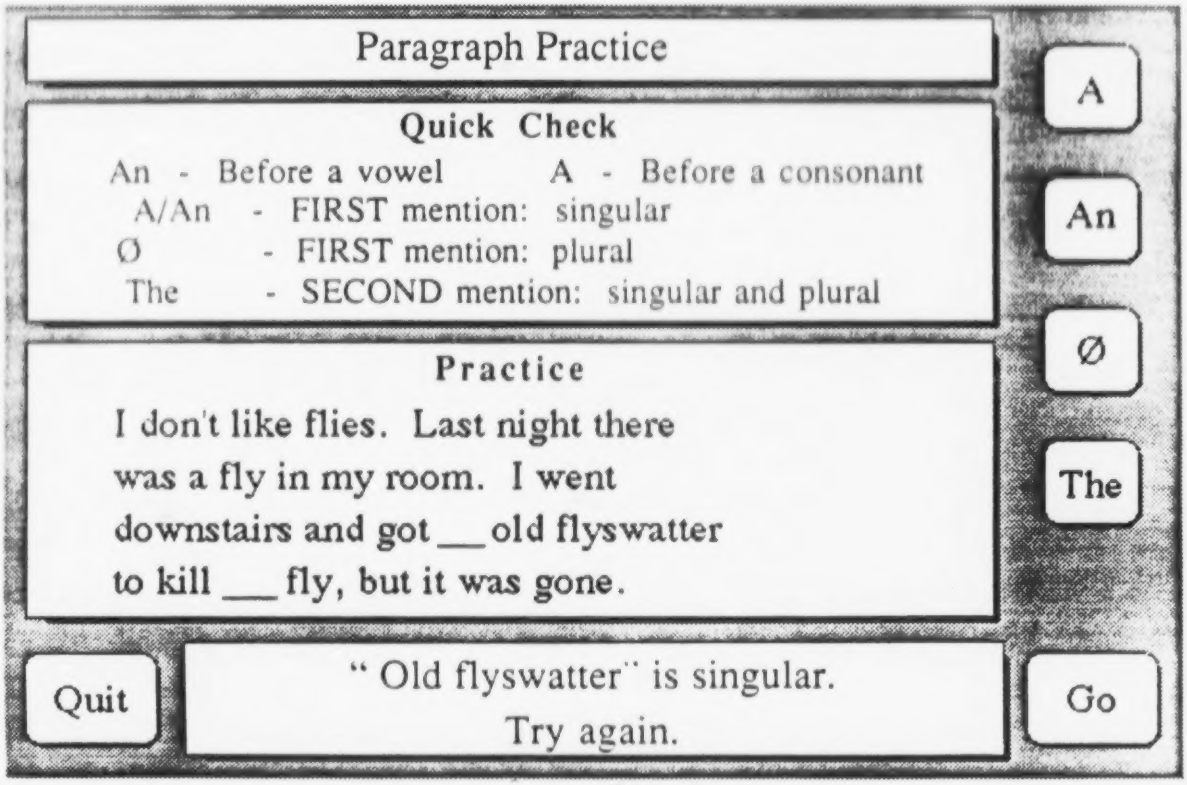
Quick Check

An - Before a vowel A - Before a consonant
A/An - FIRST mention: singular
Ø - FIRST mention: plural
The - SECOND mention: singular and plural

Practice

I baked ■ cookies for my sister. She took ___ cookies to _ party for her friend. At ___ party __ old magician did __ magical tricks.

Please choose A, An, or Ø.



Paragraph Practice

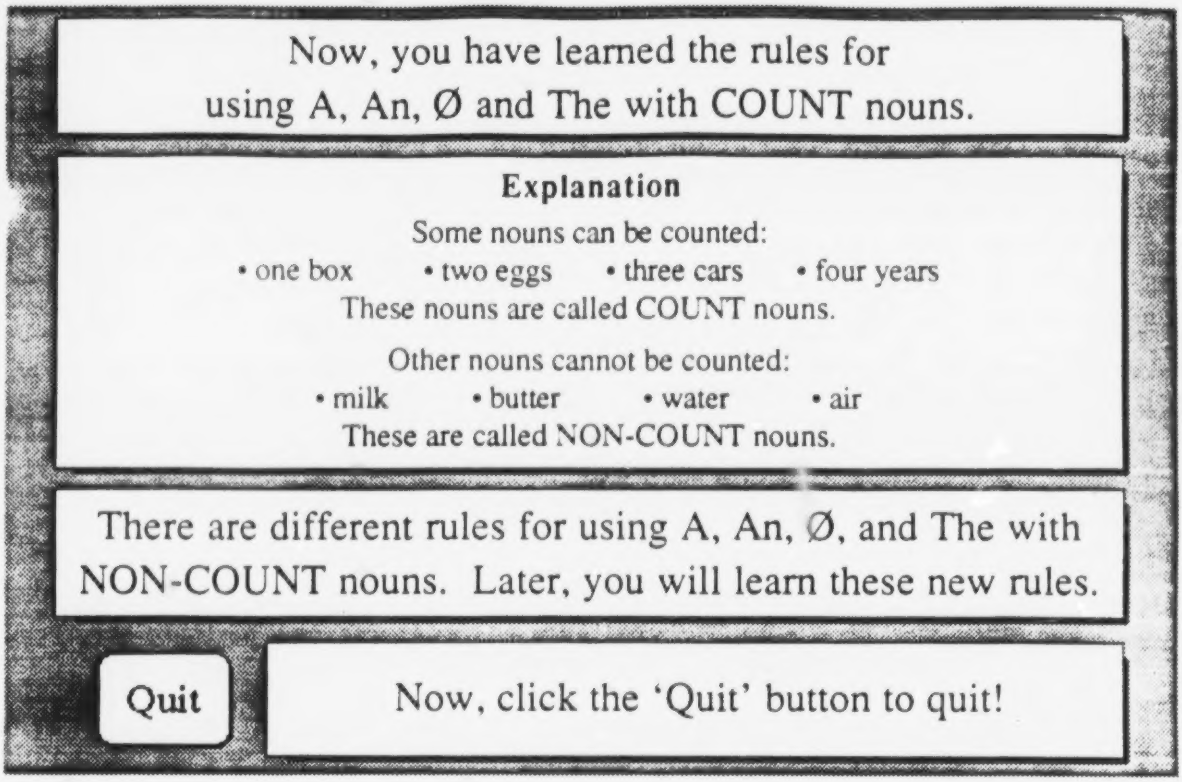
Quick Check

An - Before a vowel A - Before a consonant
A/An - FIRST mention: singular
Ø - FIRST mention: plural
The - SECOND mention: singular and plural

Practice

I don't like flies. Last night there was a fly in my room. I went downstairs and got __ old flyswatter to kill ___ fly, but it was gone.

" Old flyswatter" is singular.
Try again.



Now, you have learned the rules for
using A, An, Ø and The with COUNT nouns.

Explanation

Some nouns can be counted:

- one box
- two eggs
- three cars
- four years

These nouns are called COUNT nouns.

Other nouns cannot be counted:

- milk
- butter
- water
- air

These are called NON-COUNT nouns.

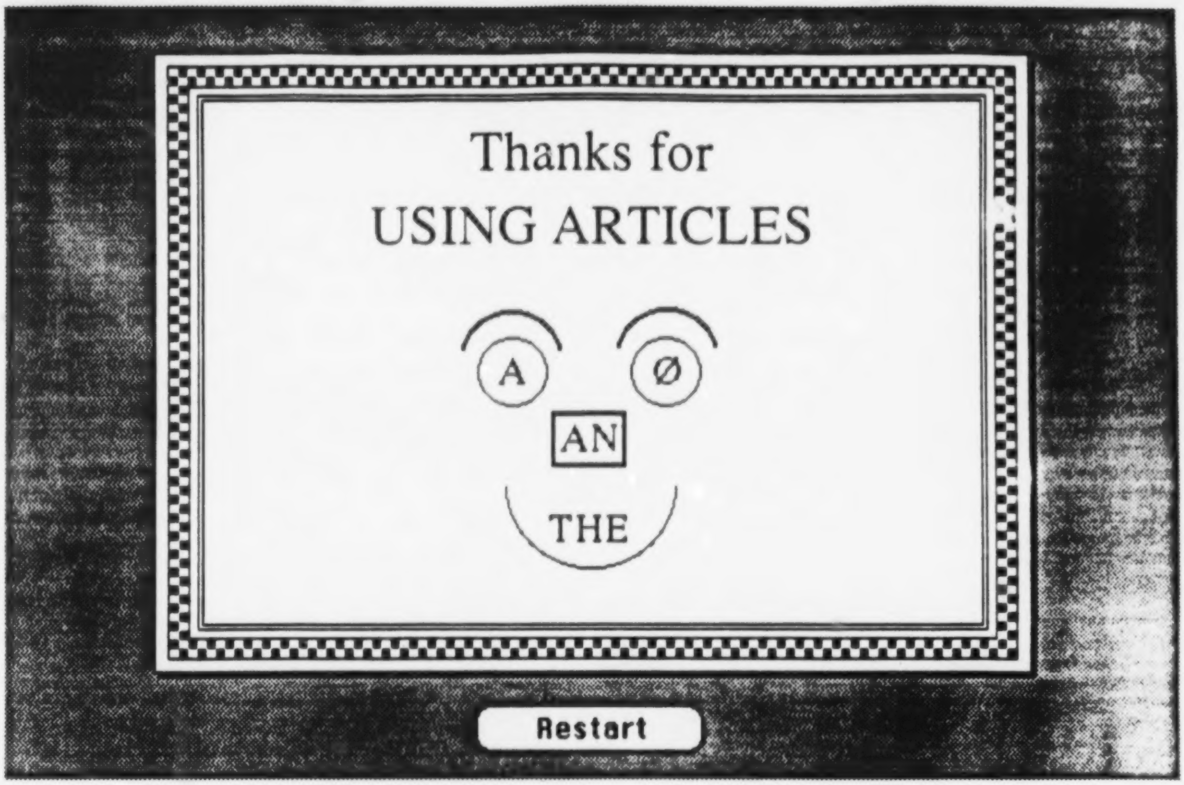
There are different rules for using A, An, Ø, and The with NON-COUNT nouns. Later, you will learn these new rules.

Now, click the 'Quit' button to quit!

Quit

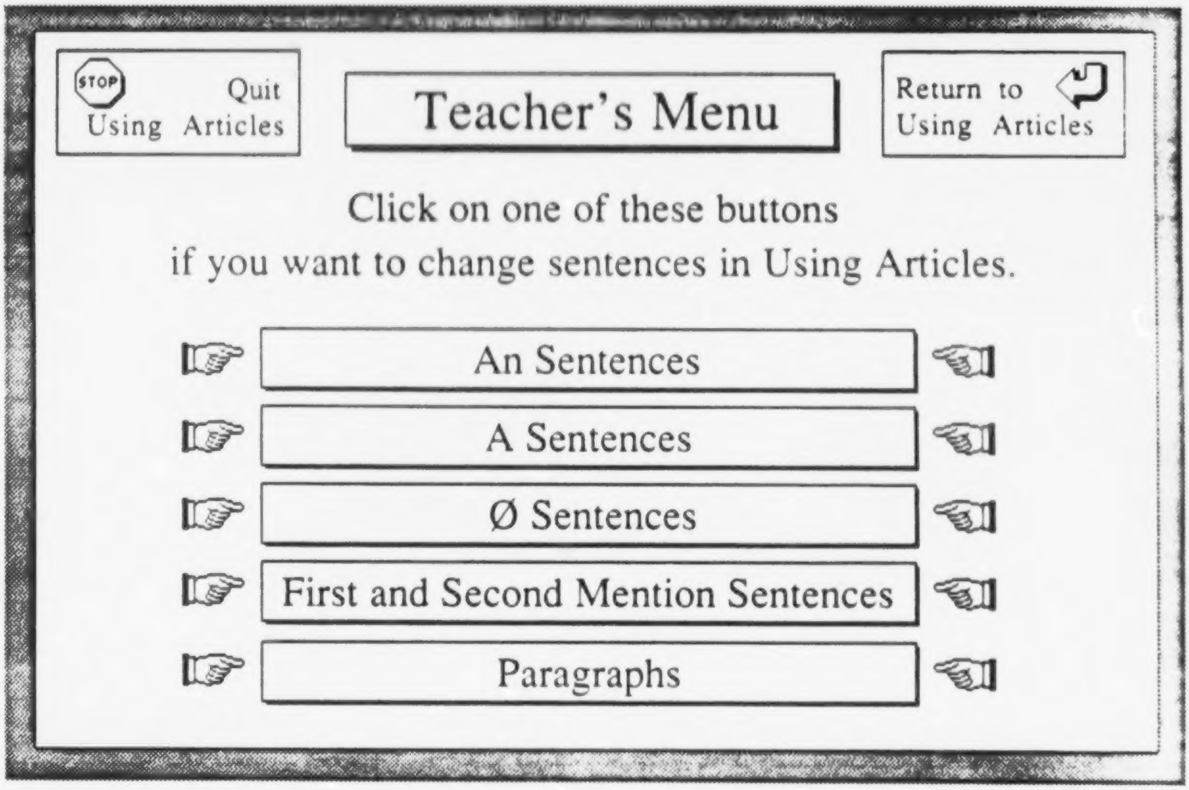
Thanks for
USING ARTICLES

A
Ø
AN
THE
Restart



Thanks for
USING ARTICLES

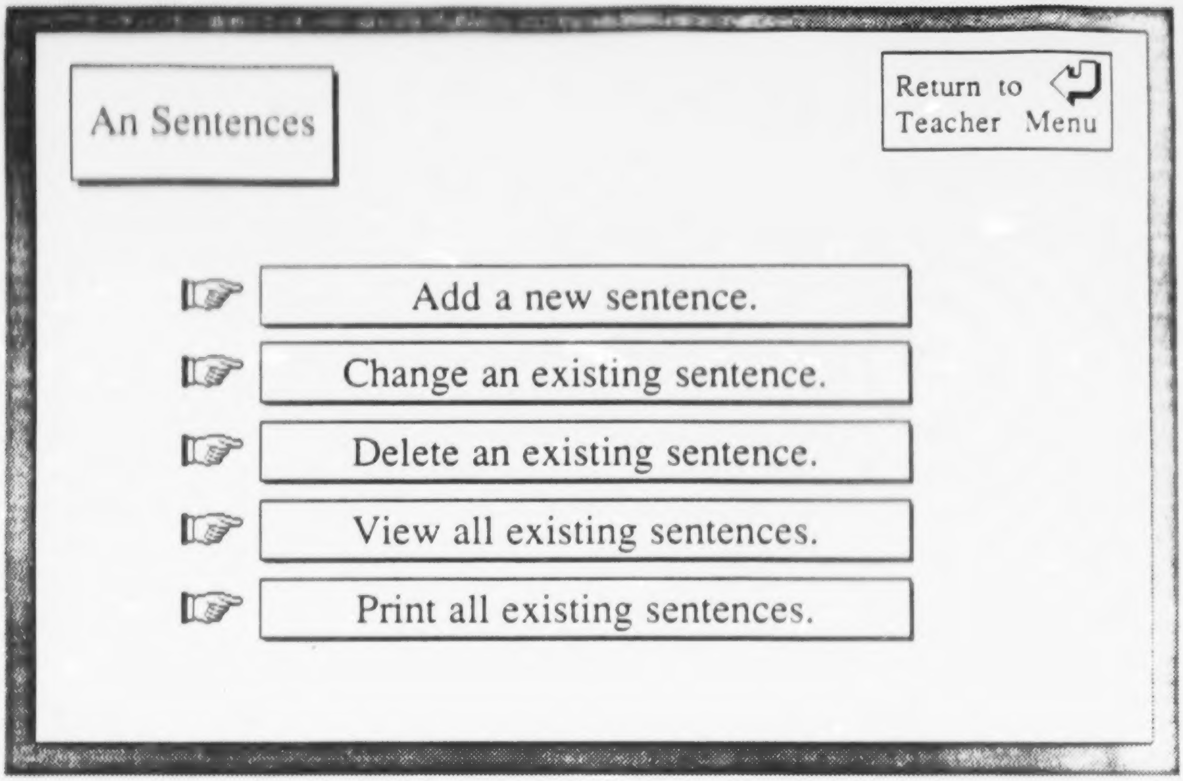
A
Ø
AN
THE
Restart

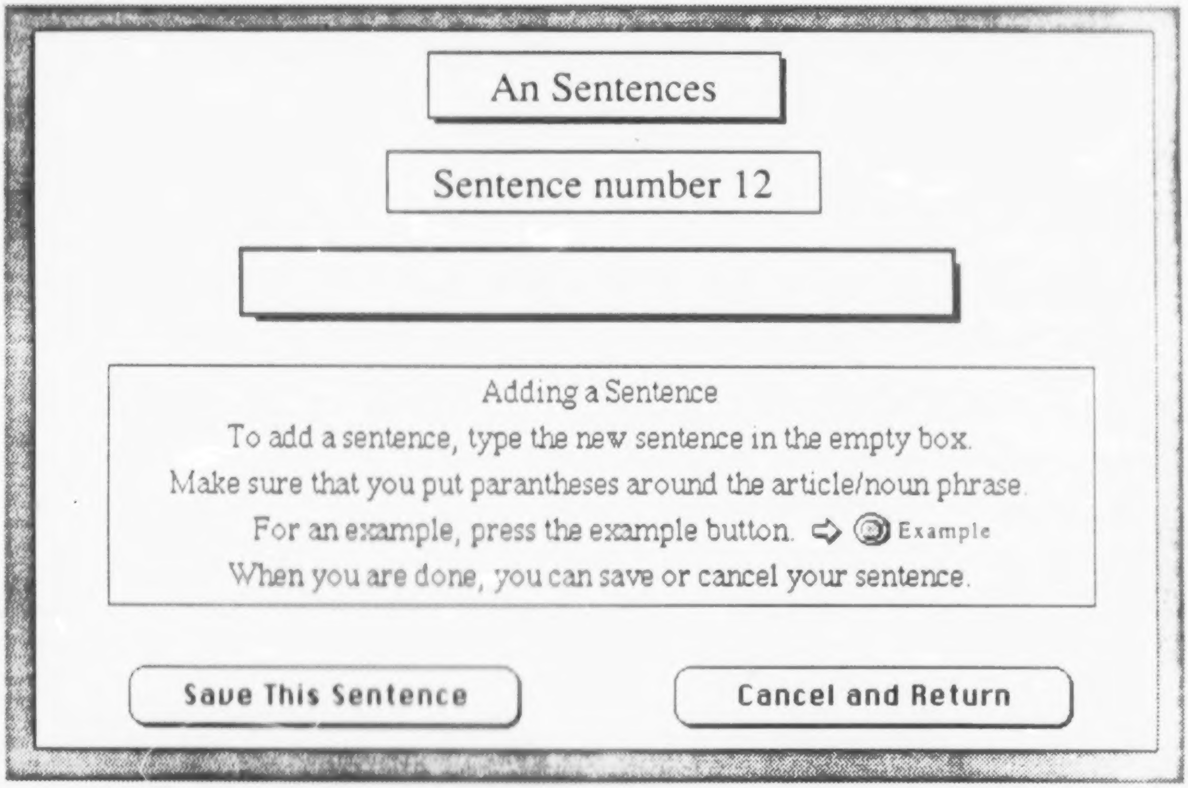


Teacher's Menu

Click on one of these buttons
if you want to change sentences in Using Articles.

STOP
Quit Using Articles
Return to Using Articles
An Sentences
A Sentences
Ø Sentences
First and Second Mention Sentences
Paragraphs


An Sentences
Return to Teacher Menu
Add a new sentence.
Change an existing sentence.
Delete an existing sentence.
View all existing sentences.
Print all existing sentences.


An Sentences
Sentence number 12

Adding a Sentence

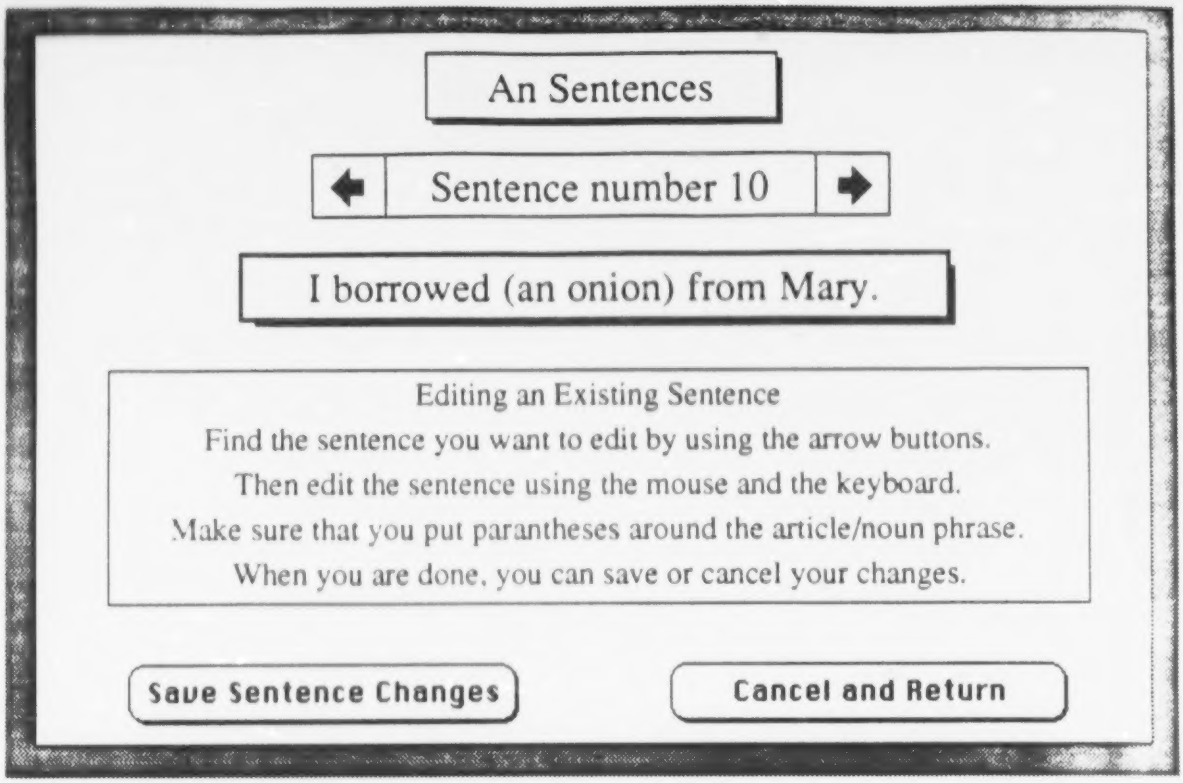
To add a sentence, type the new sentence in the empty box.

Make sure that you put parantheses around the article/noun phrase.

For an example, press the example button. ⇨ Example

When you are done, you can save or cancel your sentence.

Save This Sentence
Cancel and Return



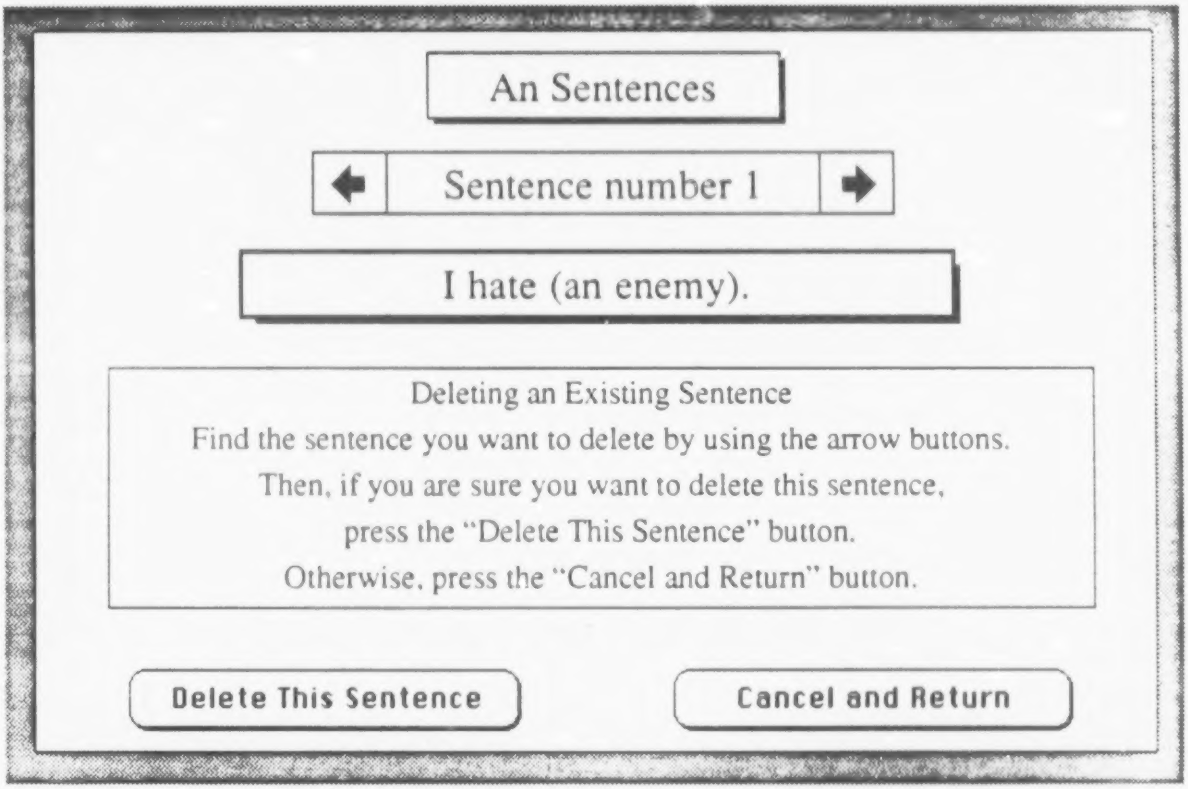
An Sentences

Sentence number 10

I borrowed (an onion) from Mary.

Editing an Existing Sentence
Find the sentence you want to edit by using the arrow buttons.
Then edit the sentence using the mouse and the keyboard.
Make sure that you put parantheses around the article/noun phrase.
When you are done, you can save or cancel your changes.

Save Sentence Changes
Cancel and Return



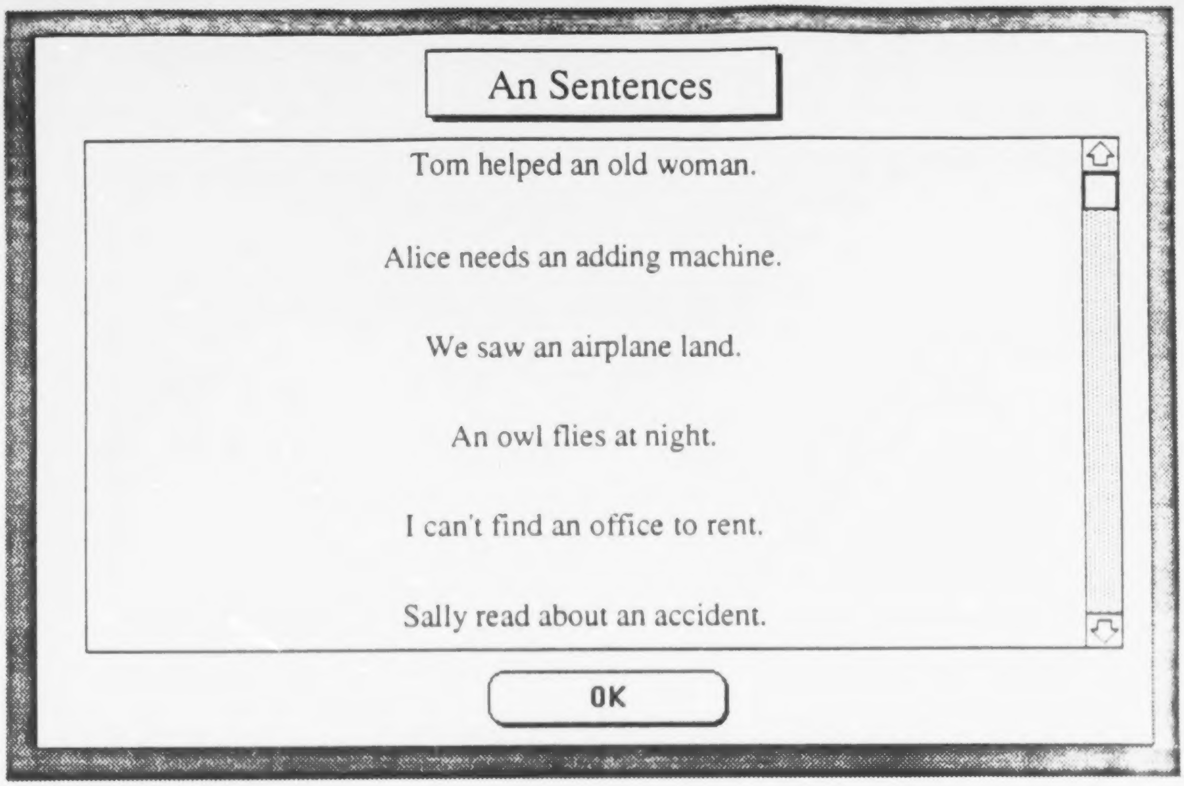
An Sentences

Sentence number 1

I hate (an enemy).

Deleting an Existing Sentence
Find the sentence you want to delete by using the arrow buttons.
Then, if you are sure you want to delete this sentence,
press the "Delete This Sentence" button.
Otherwise, press the "Cancel and Return" button.

Delete This Sentence
Cancel and Return


An Sentences

Tom helped an old woman.

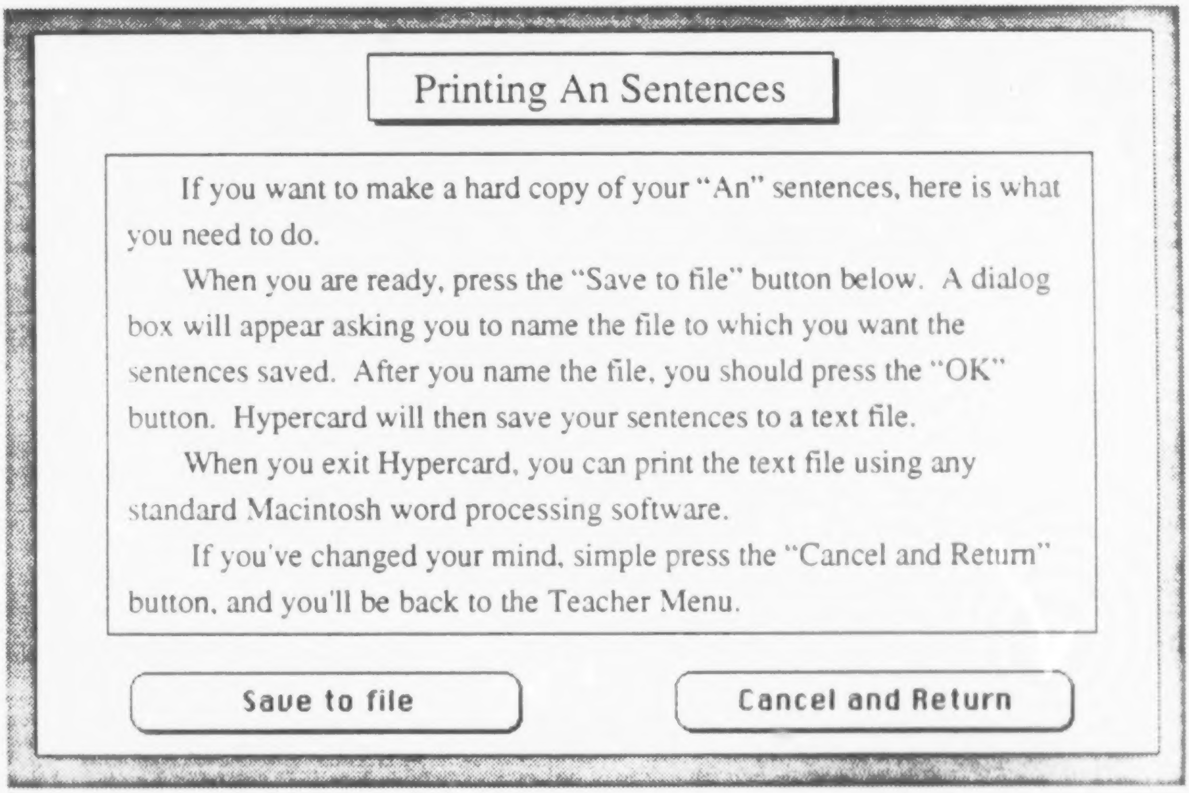
Alice needs an adding machine.

We saw an airplane land.

An owl flies at night.

I can't find an office to rent.

Sally read about an accident.

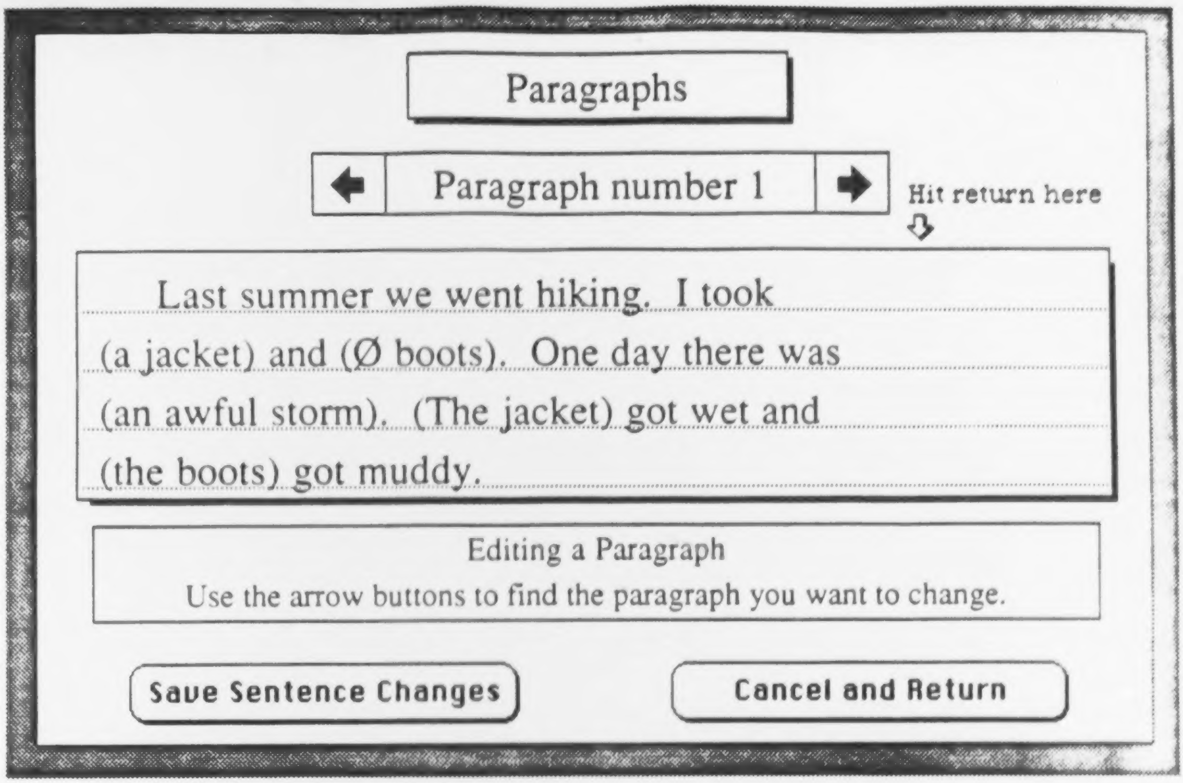

Printing An Sentences

If you want to make a hard copy of your "An" sentences, here is what you need to do.

When you are ready, press the "Save to file" button below. A dialog box will appear asking you to name the file to which you want the sentences saved. After you name the file, you should press the "OK" button. Hypercard will then save your sentences to a text file.

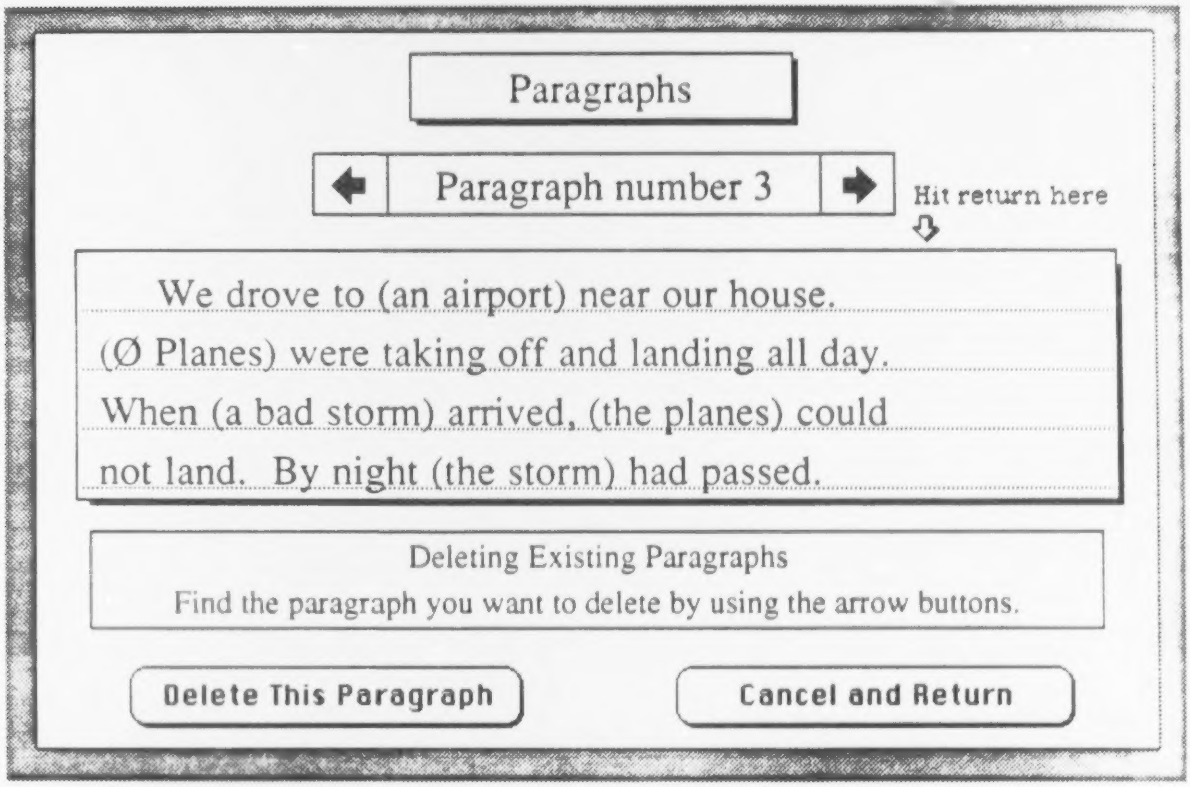
When you exit Hypercard, you can print the text file using any standard Macintosh word processing software.

If you've changed your mind, simple press the "Cancel and Return" button, and you'll be back to the Teacher Menu.


Paragraphs
Paragraph number 1
Hit return here
Save Sentence Changes
Cancel and Return

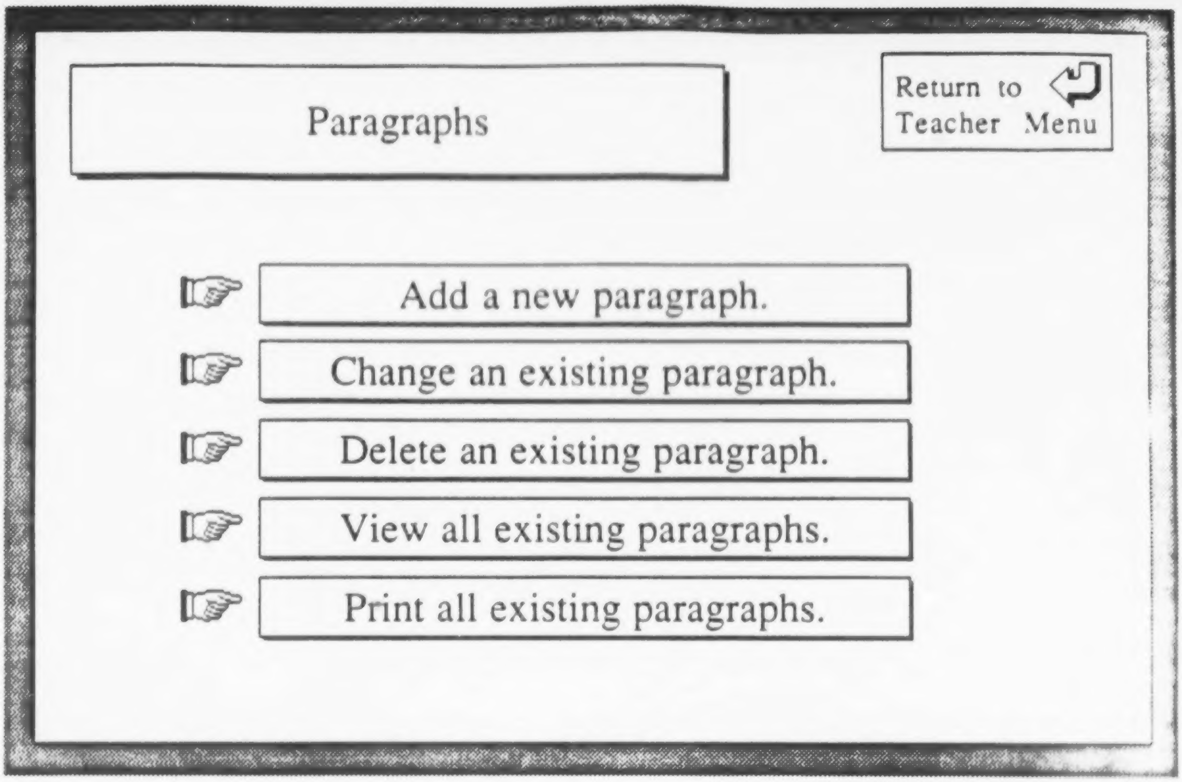
Last summer we went hiking. I took (a jacket) and (Ø boots). One day there was (an awful storm). (The jacket) got wet and (the boots) got muddy.

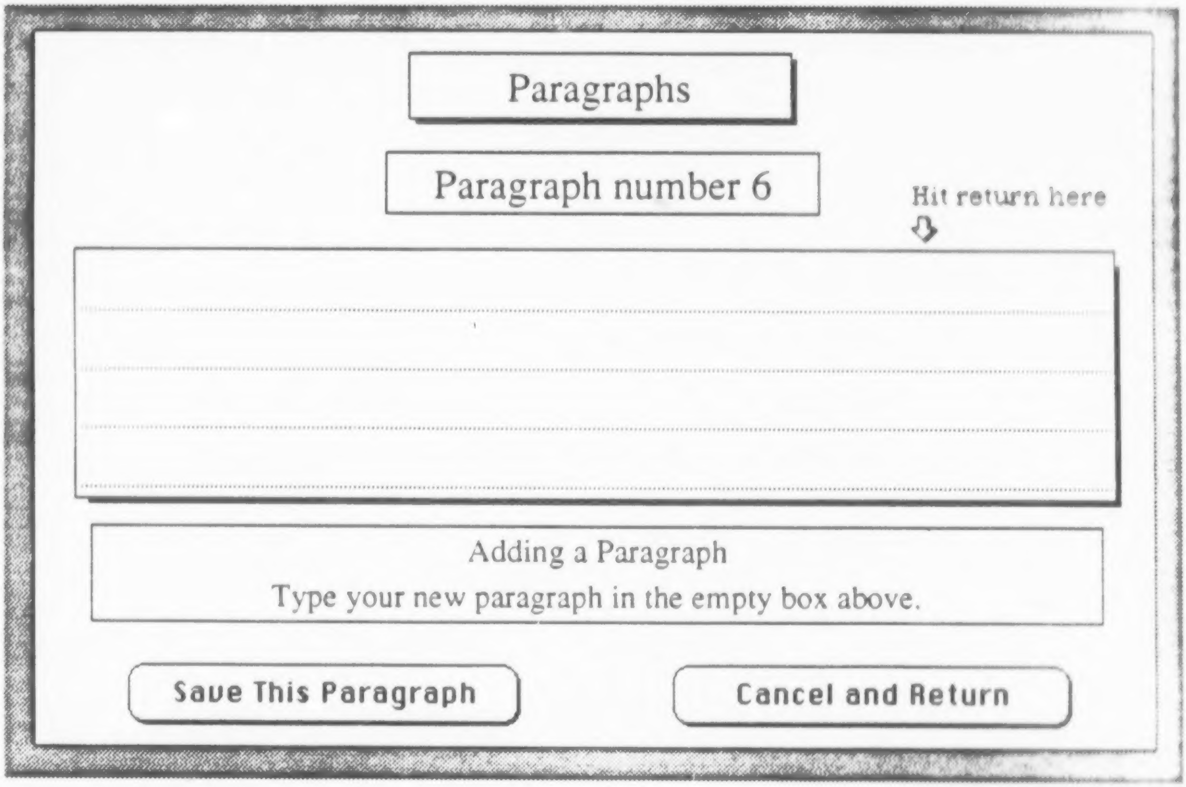
Editing a Paragraph
Use the arrow buttons to find the paragraph you want to change.


Paragraphs
Paragraph number 3
Hit return here
Delete This Paragraph
Cancel and Return

We drove to (an airport) near our house. (Ø Planes) were taking off and landing all day. When (a bad storm) arrived, (the planes) could not land. By night (the storm) had passed.

Deleting Existing Paragraphs
Find the paragraph you want to delete by using the arrow buttons.


Paragraphs
Return to Teacher Menu
Add a new paragraph.
Change an existing paragraph.
Delete an existing paragraph.
View all existing paragraphs.
Print all existing paragraphs.

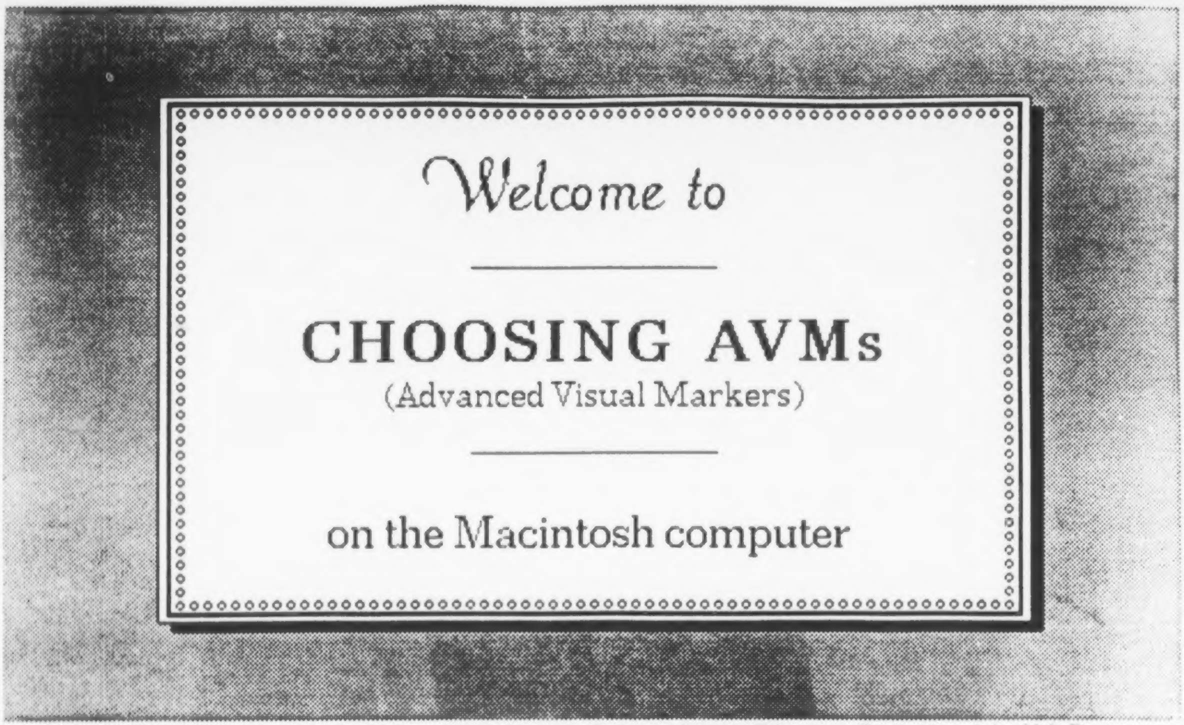

Paragraphs
Paragraph number 6
Hit return here
Adding a Paragraph
Save This Paragraph
Cancel and Return

Type your new paragraph in the empty box above.

APPENDIX 3

Choosing AVMs

Sample screens

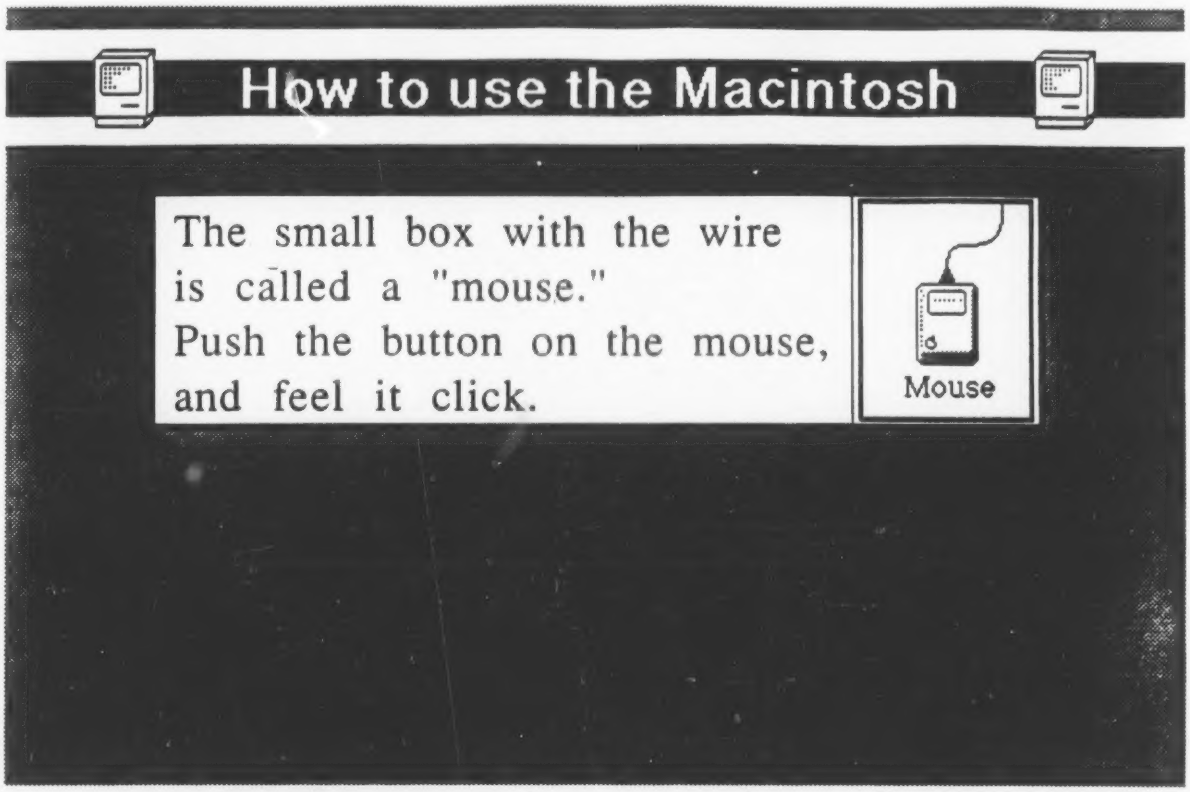


Welcome to

CHOOSING AVMs
(Advanced Visual Markers)

on the Macintosh computer

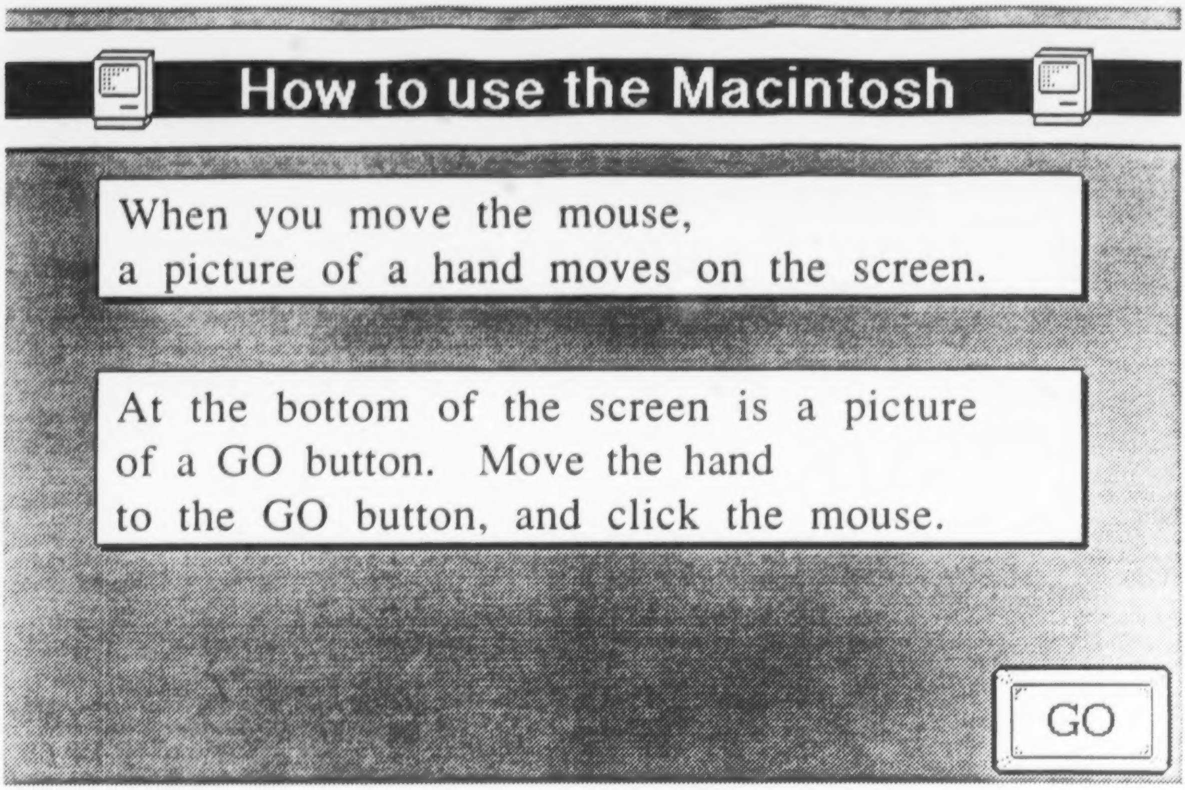
Choosing AVMs is part of the AVM Project, funded by the Office of Special Education Programs of the U.S. Department of Education. Nancy S. Fogel, Project Director, American Institutes for Research, Palo Alto, CA. April, 1988.



How to use the Macintosh

The small box with the wire is called a "mouse."
Push the button on the mouse, and feel it click.

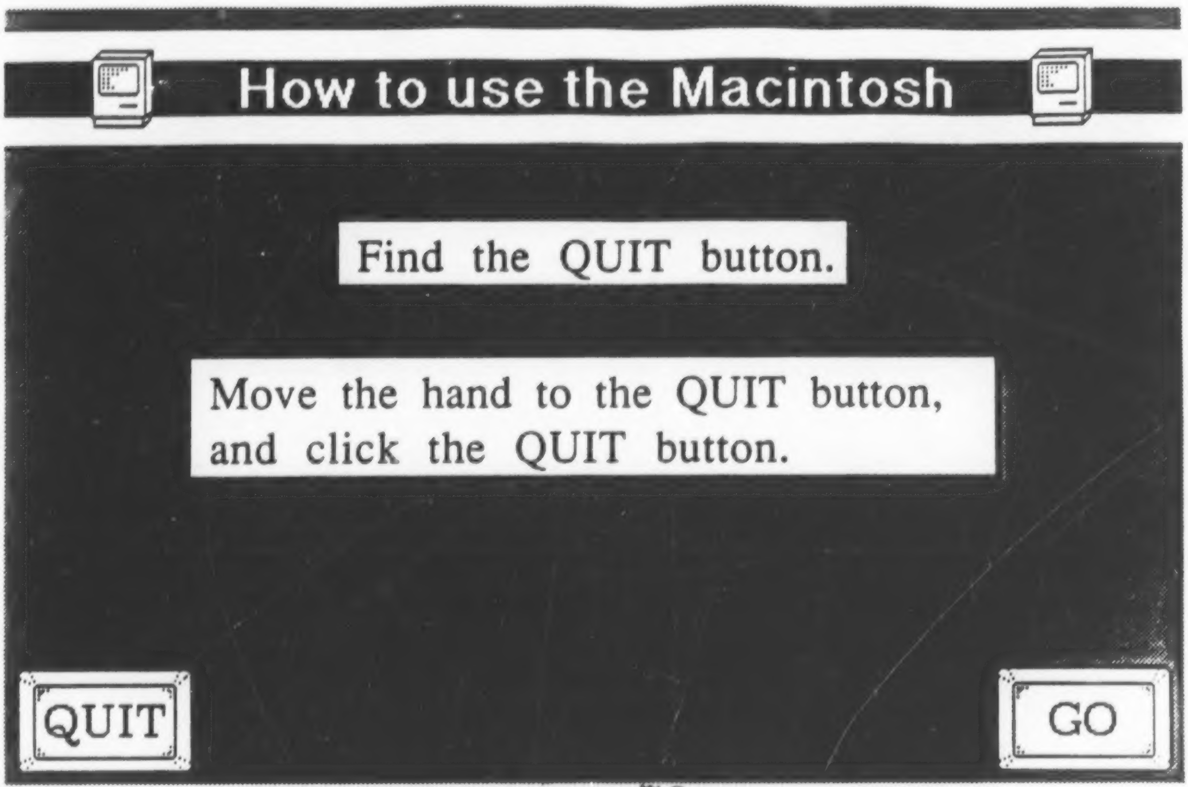
BEST COPY AVAILABLE



How to use the Macintosh

When you move the mouse,
a picture of a hand moves on the screen.

At the bottom of the screen is a picture of a GO button. Move the hand to the GO button, and click the mouse.

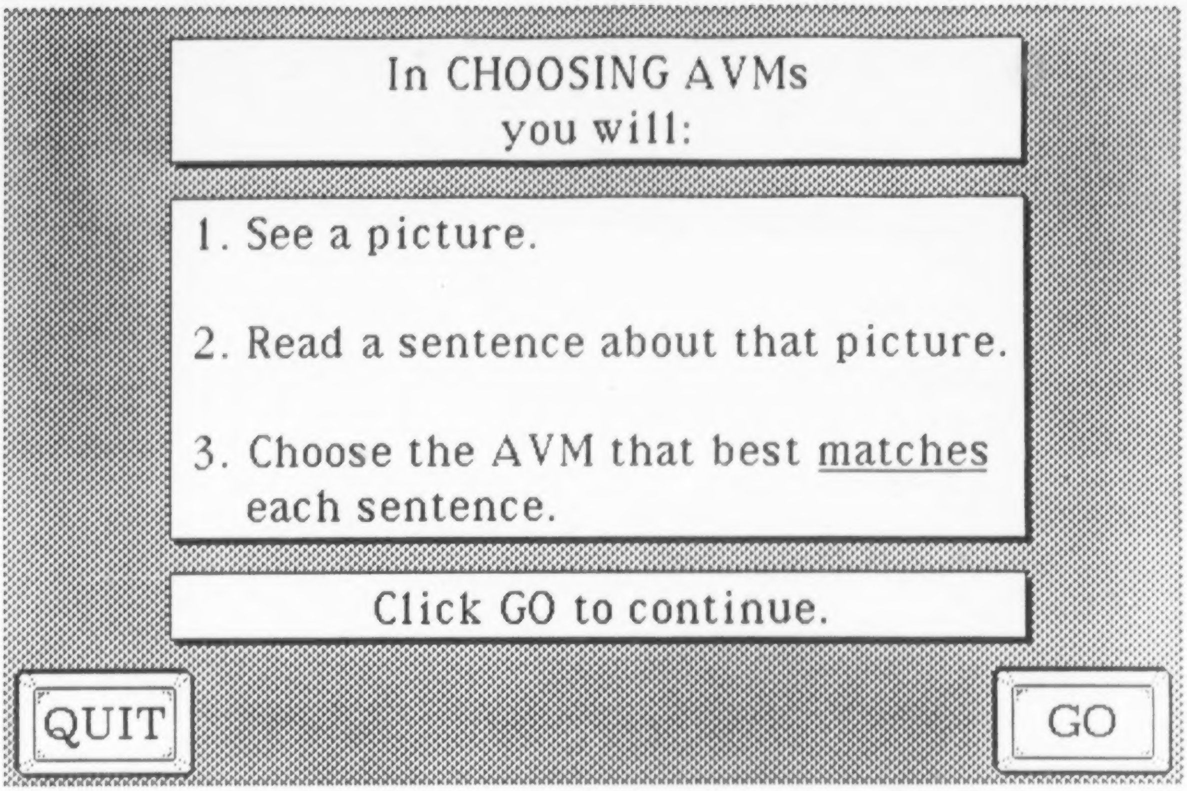


How to use the Macintosh

Find the QUIT button.

Move the hand to the QUIT button, and click the QUIT button.

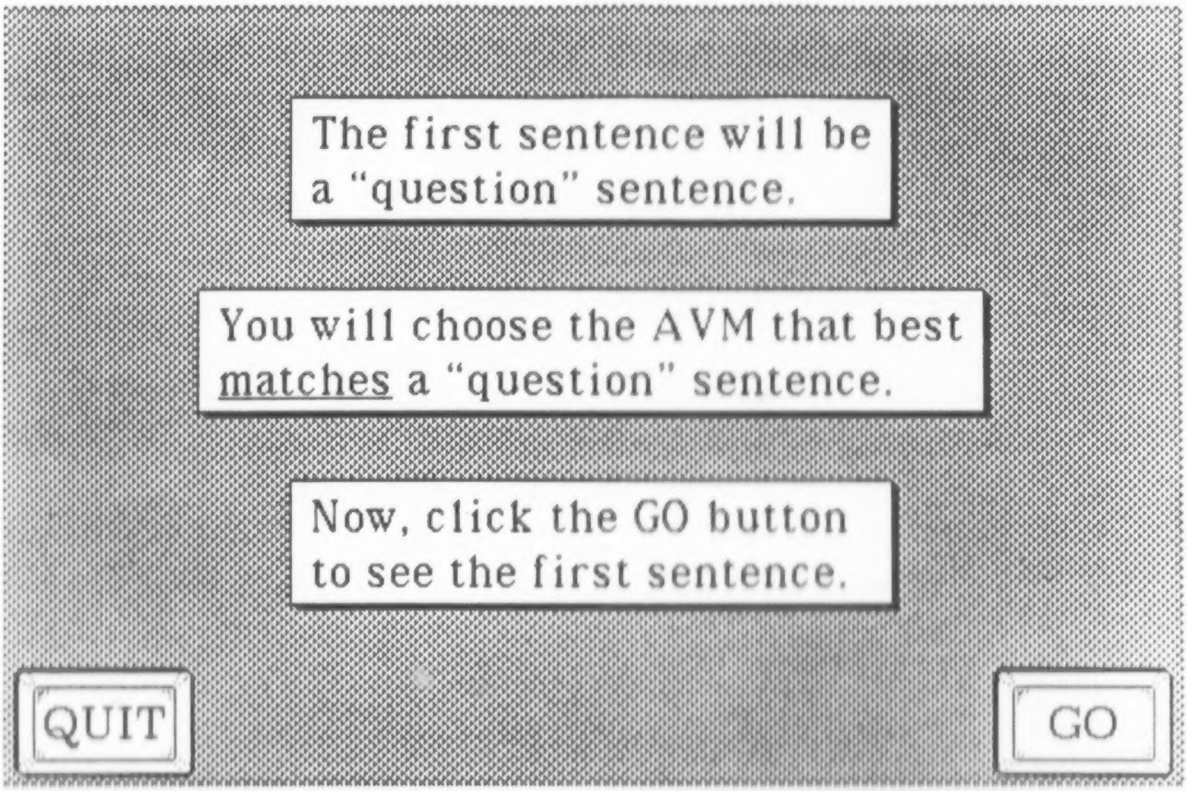
BEST COPY AVAILABLE



In CHOOSING AVMs
you will:

1. See a picture.
2. Read a sentence about that picture.
3. Choose the AVM that best matches each sentence.

Click GO to continue.

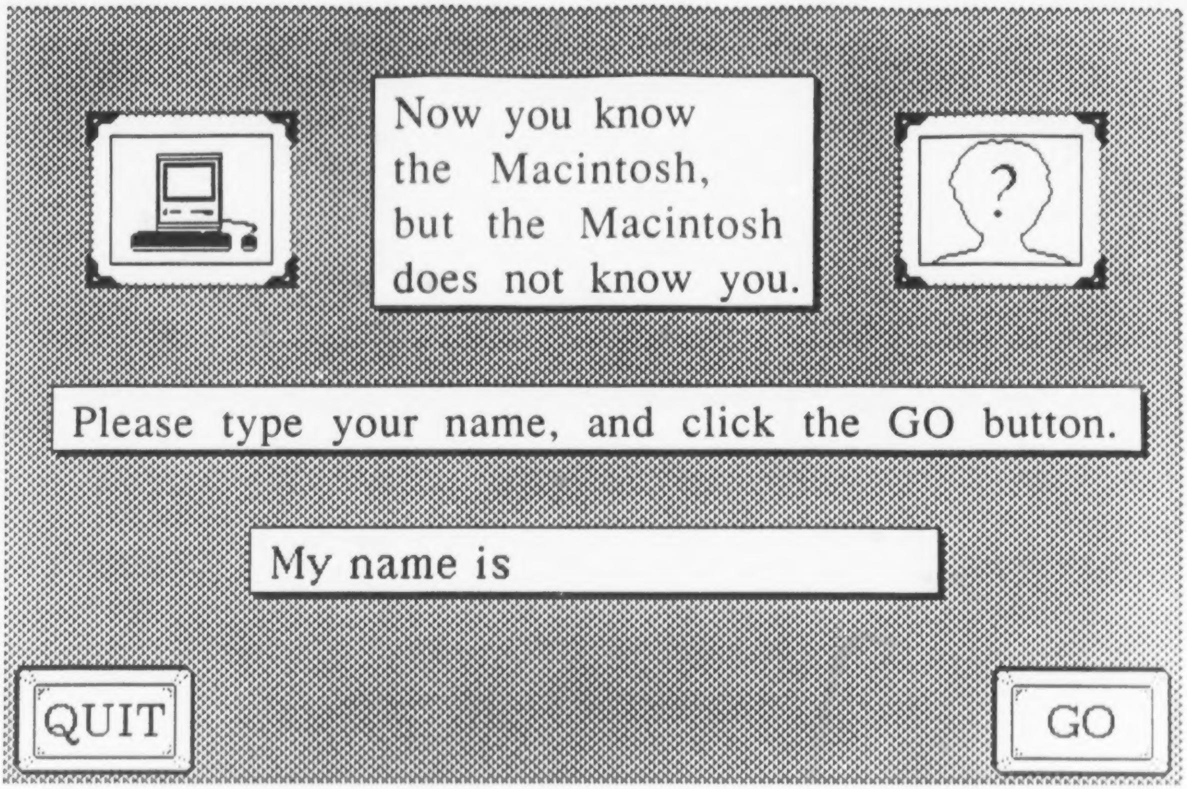


The first sentence will be a "question" sentence.

You will choose the AVM that best matches a "question" sentence.

Now, click the GO button to see the first sentence.

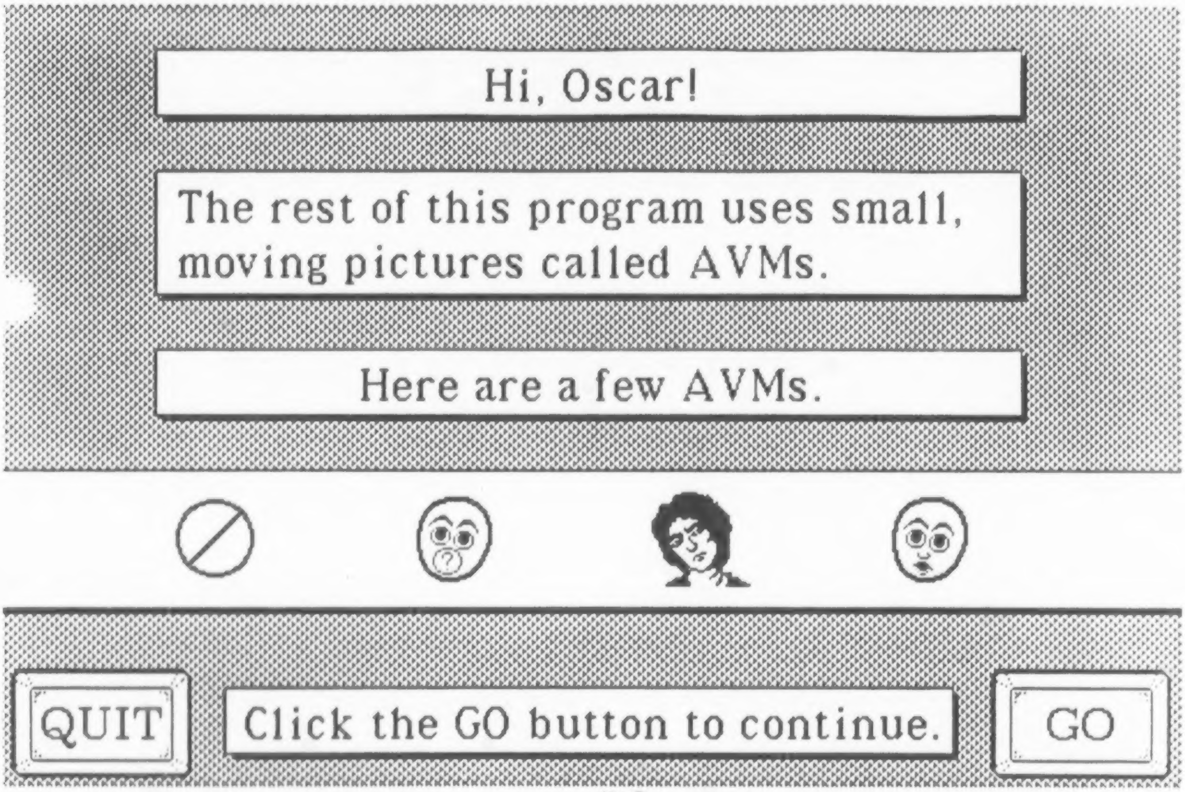
BEST COPY AVAILABLE



Now you know the Macintosh, but the Macintosh does not know you.

Please type your name, and click the GO button.

My name is

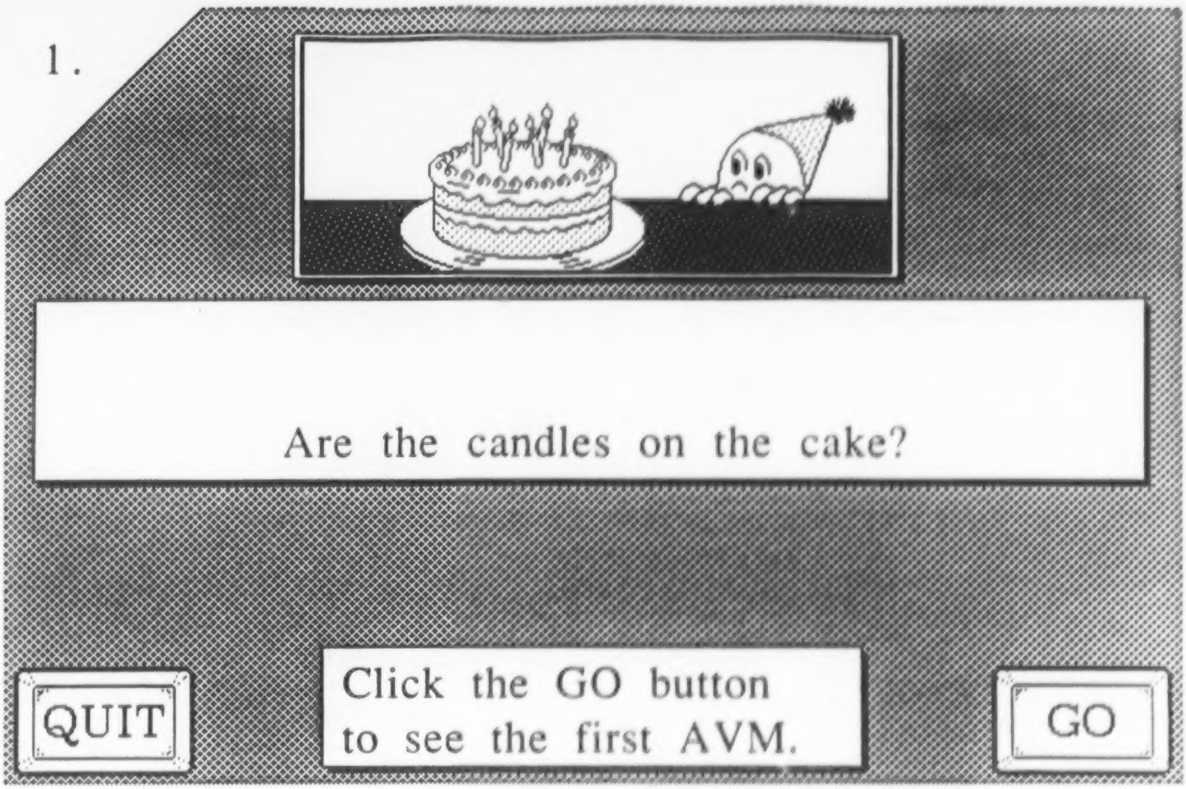


Hi, Oscar!

The rest of this program uses small, moving pictures called AVMs.

Here are a few AVMs.

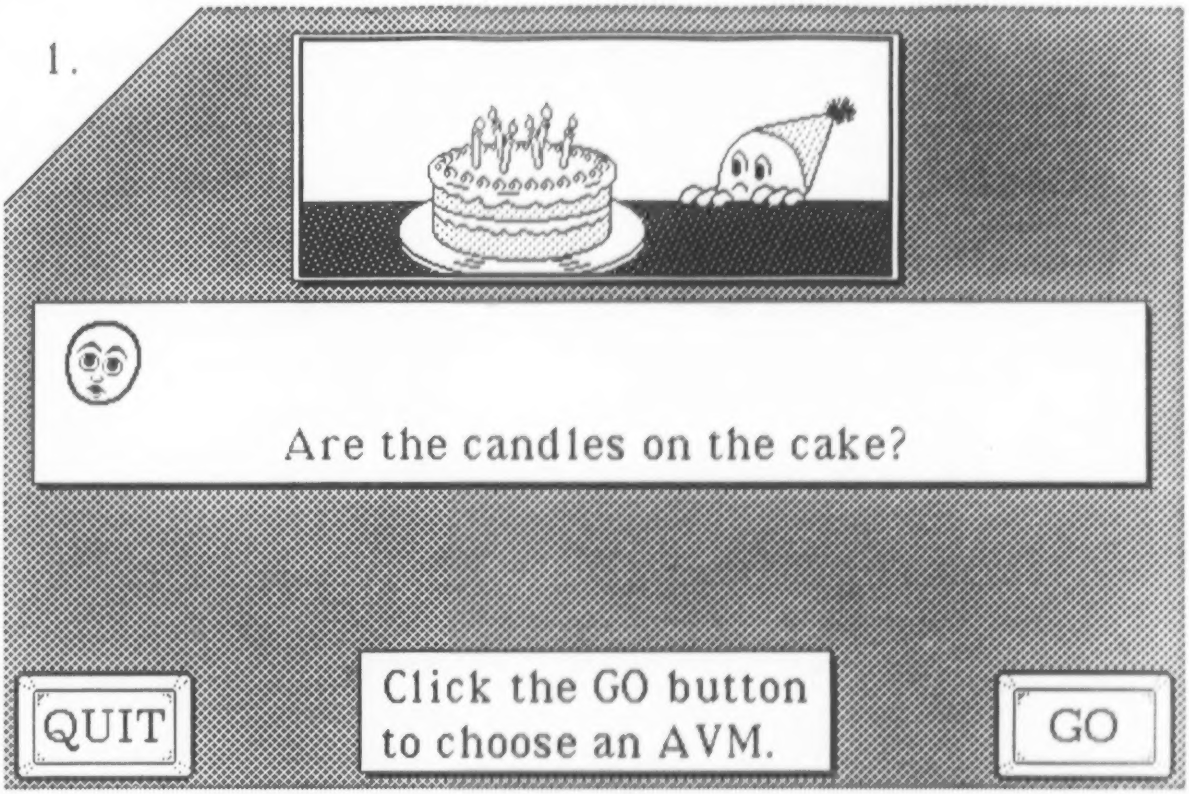
Click the GO button to continue.



1.

Are the candles on the cake?

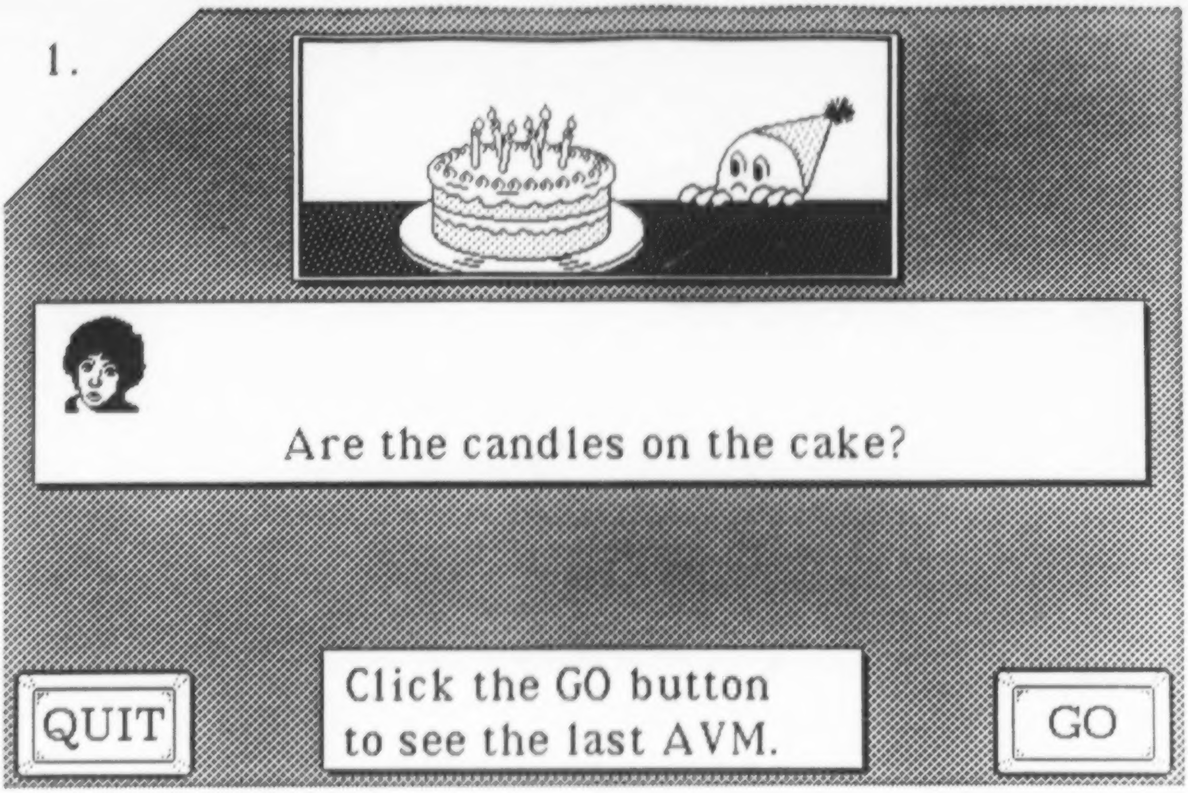
Click the GO button to see the first AVM.



1.

Are the candles on the cake?

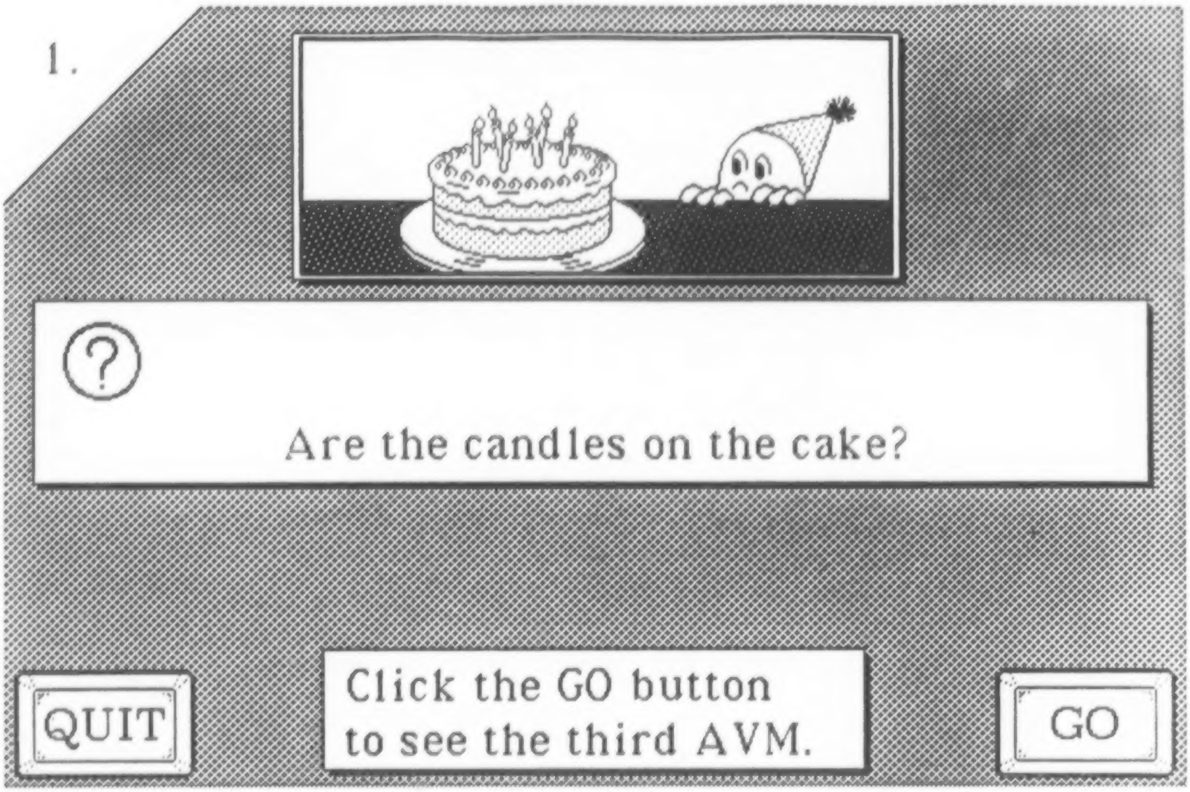
Click the GO button to choose an AVM.



1.

Are the candles on the cake?

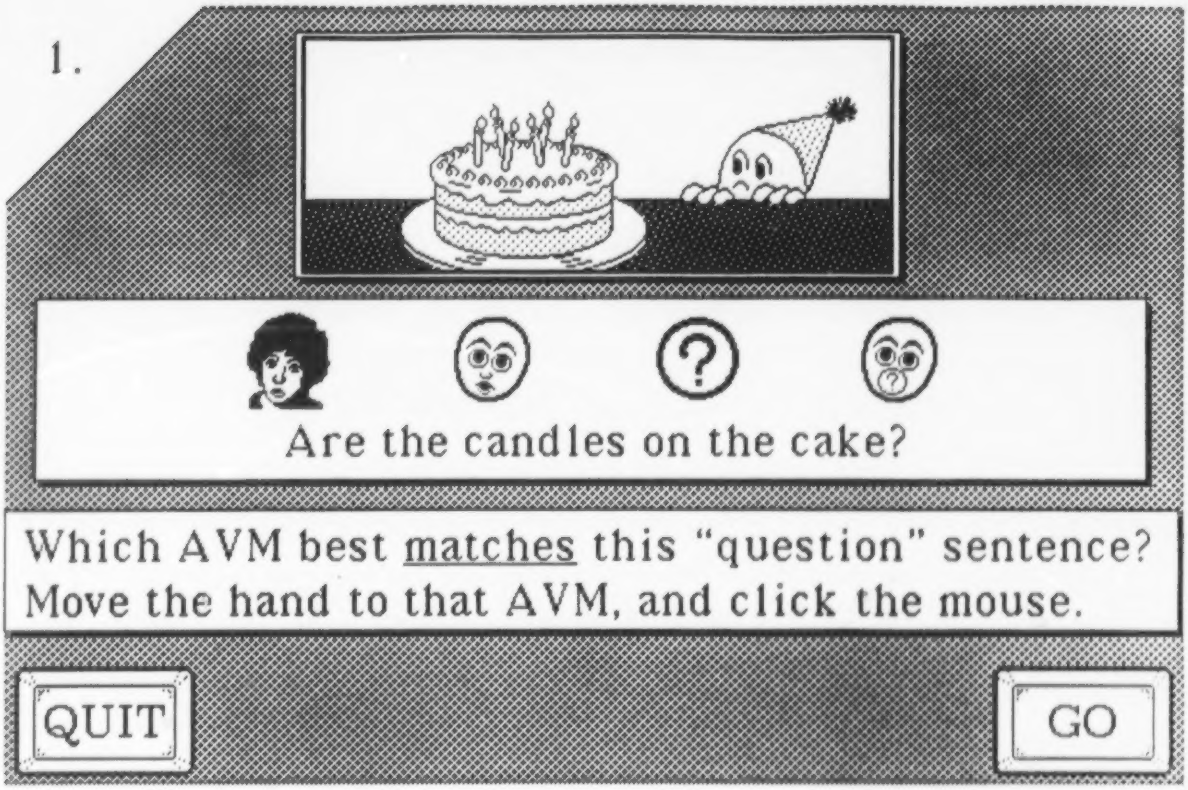
Click the GO button
to see the last AVM.



1.

Are the candles on the cake?

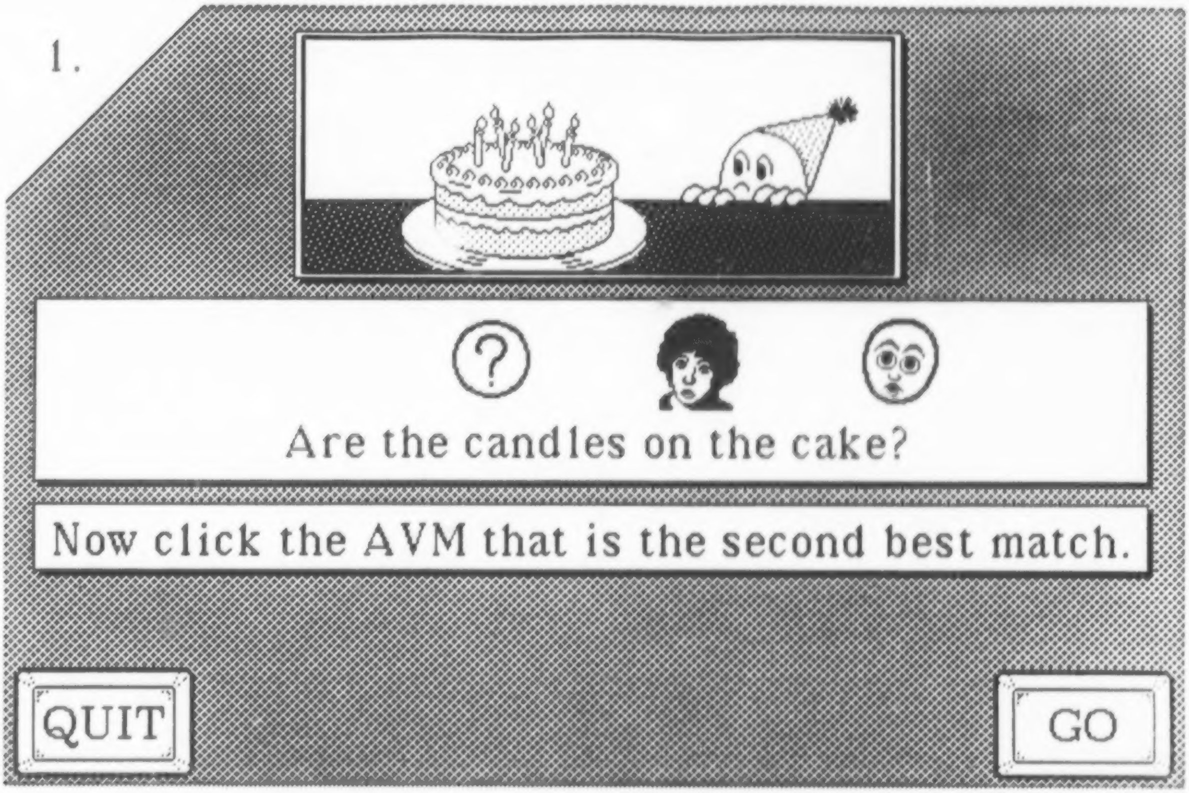
Click the GO button
to see the third AVM.



1.

Are the candles on the cake?

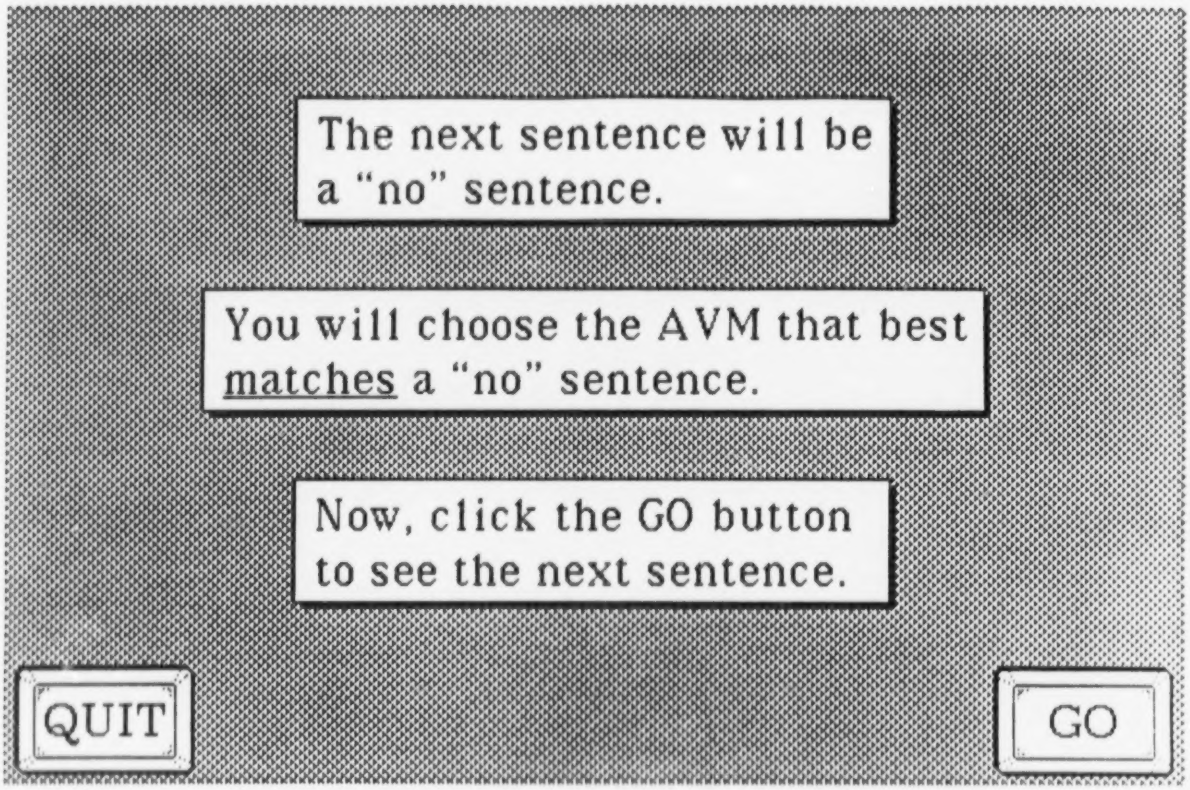
Which AVM best matches this "question" sentence? Move the hand to that AVM, and click the mouse.



1.

Are the candles on the cake?

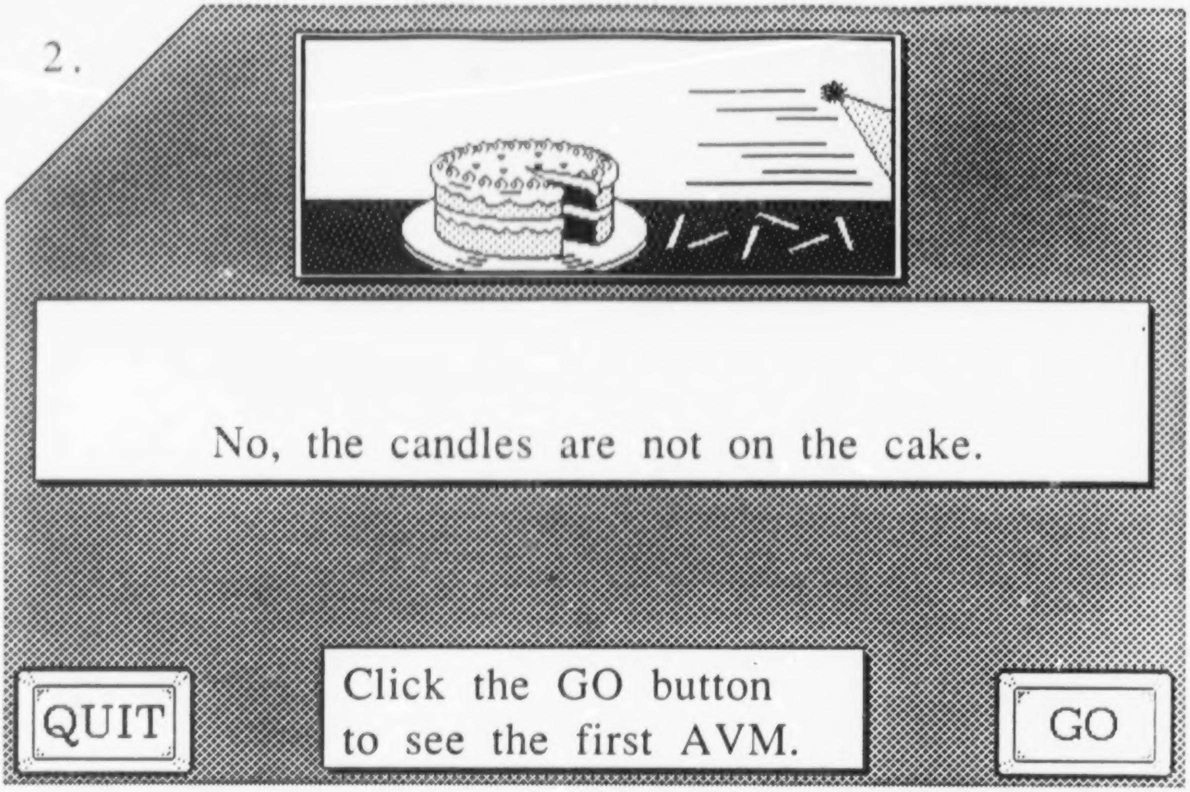
Now click the AVM that is the second best match.


The next sentence will be a “no” sentence.

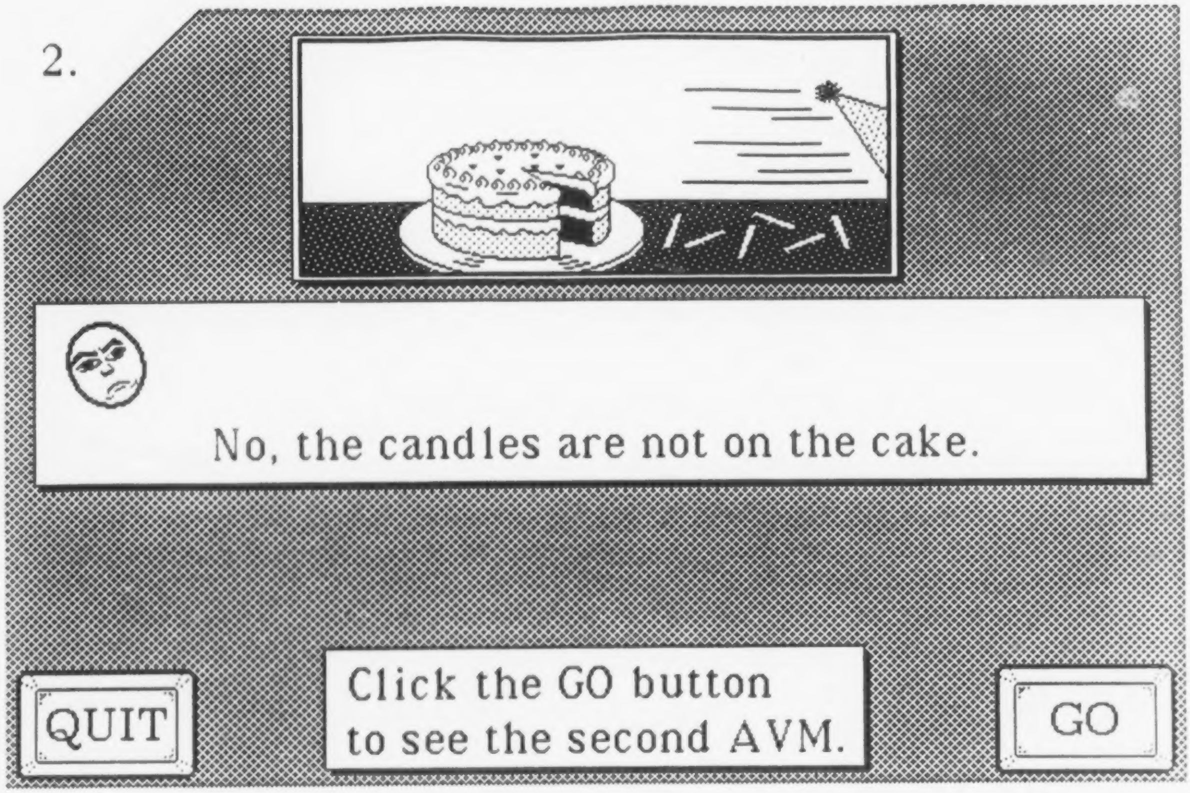
You will choose the AVM that best matches a “no” sentence.

Now, click the GO button to see the next sentence.

2.


No, the candles are not on the cake.

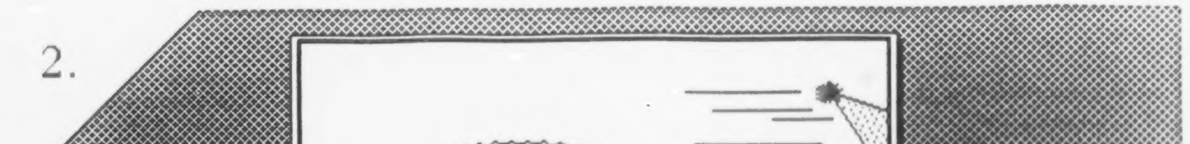
Click the GO button to see the first AVM.



2.

No, the candles are not on the cake.

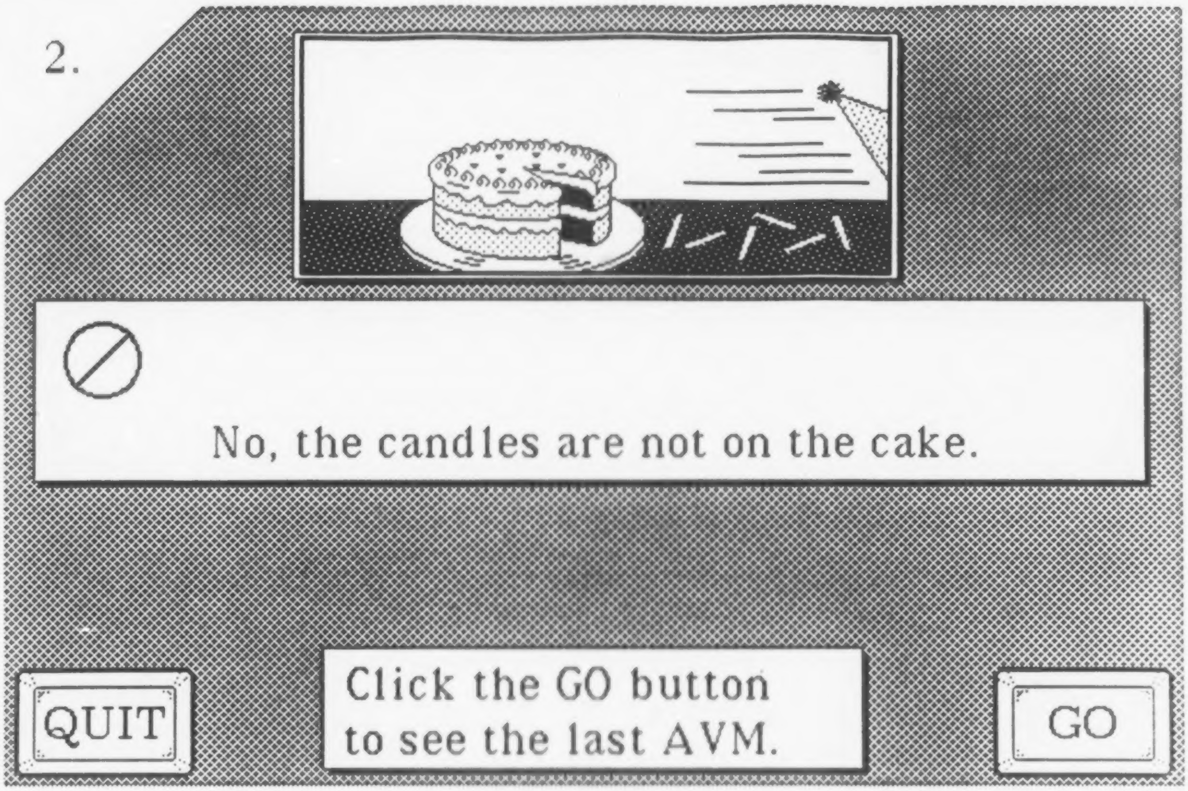
Click the GO button to see the second AVM.



2.

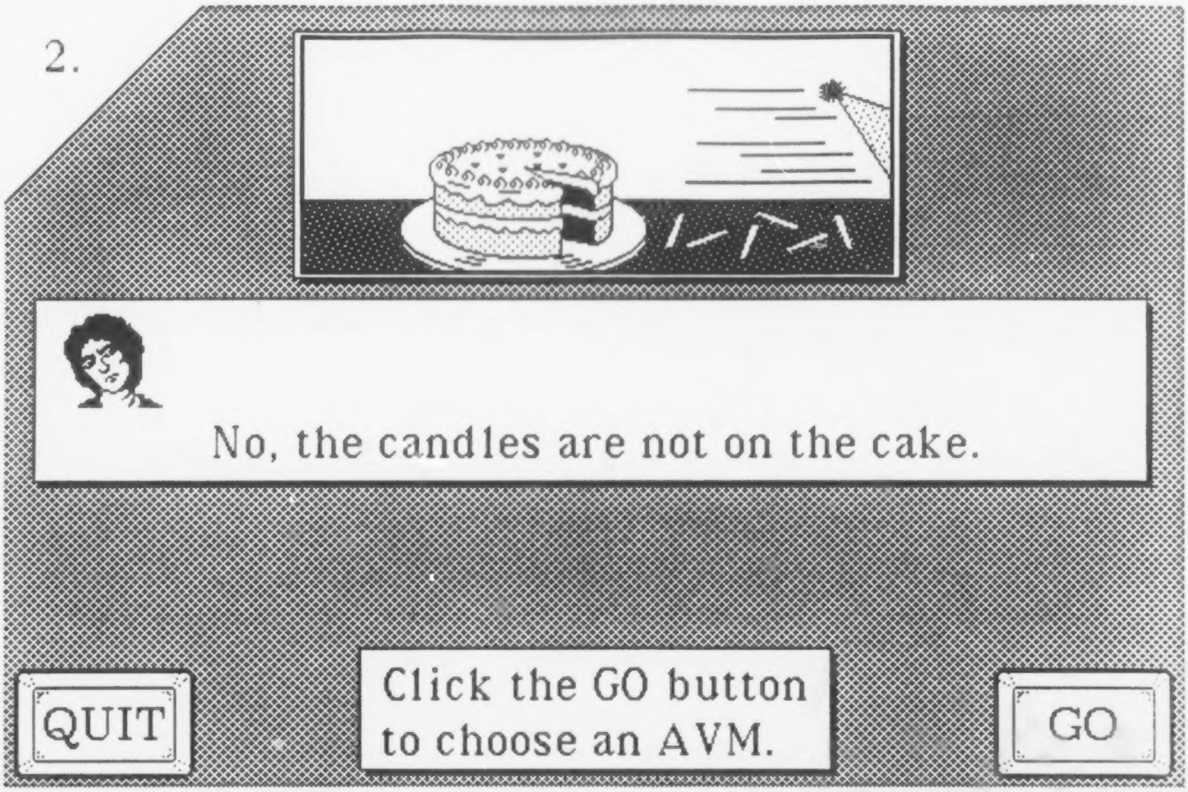
No, the candles are not on the cake.

Click the GO button to see the third AVM.



No, the candles are not on the cake.

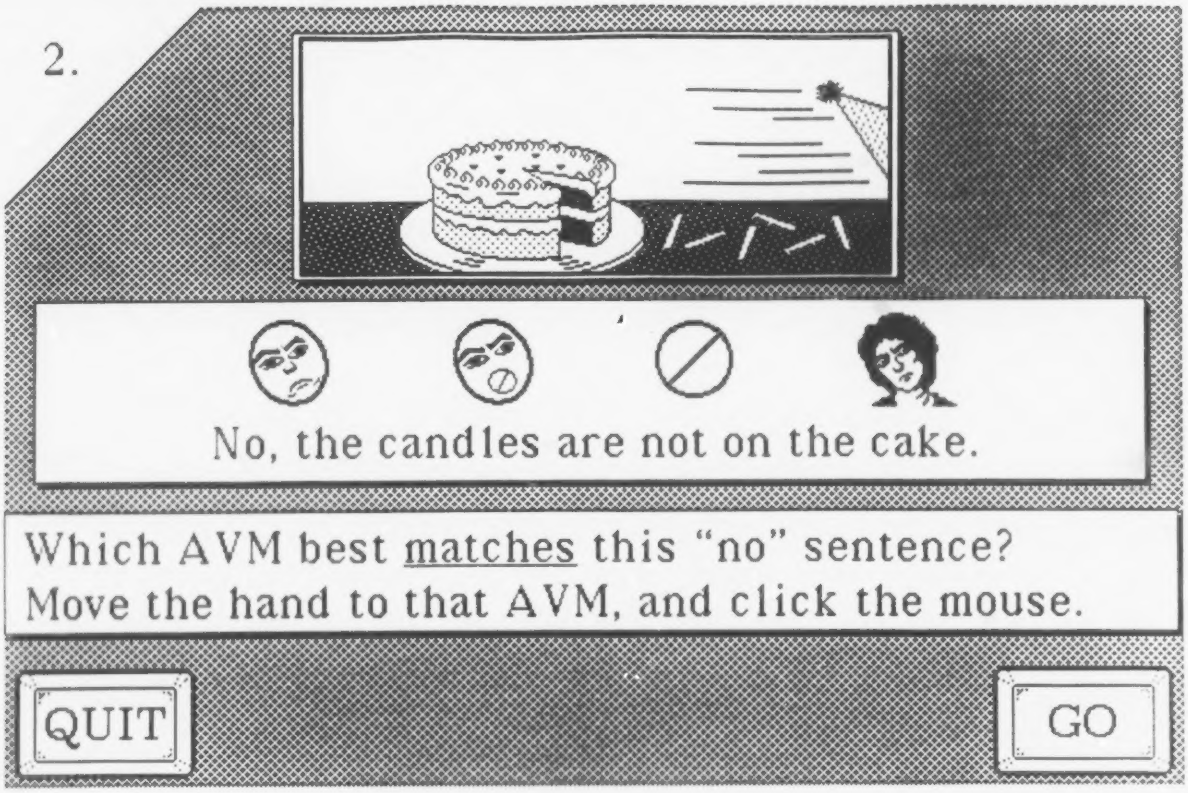
Click the GO button
to see the last AVM.



No, the candles are not on the cake.

Click the GO button
to choose an AVM.

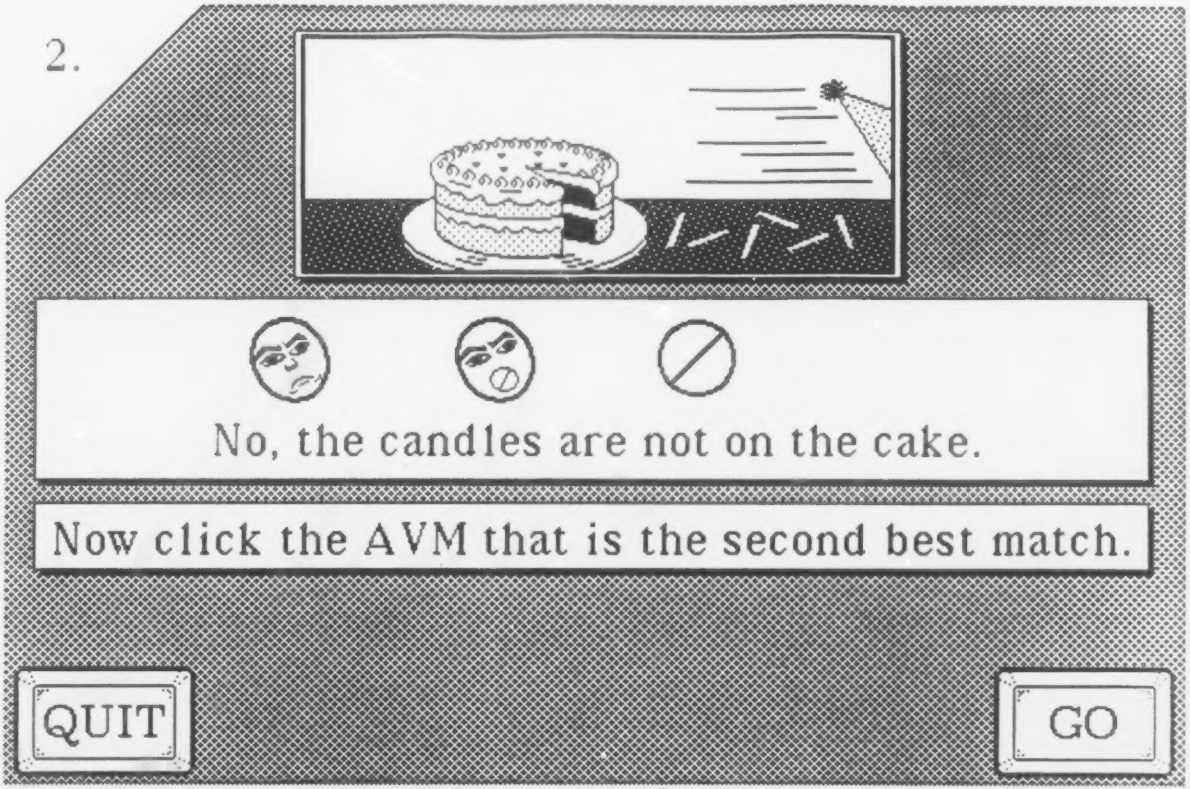
2.



No, the candles are not on the cake.

Which AVM best matches this "no" sentence?
Move the hand to that AVM, and click the mouse.

2.



No, the candles are not on the cake.

Now click the AVM that is the second best match.

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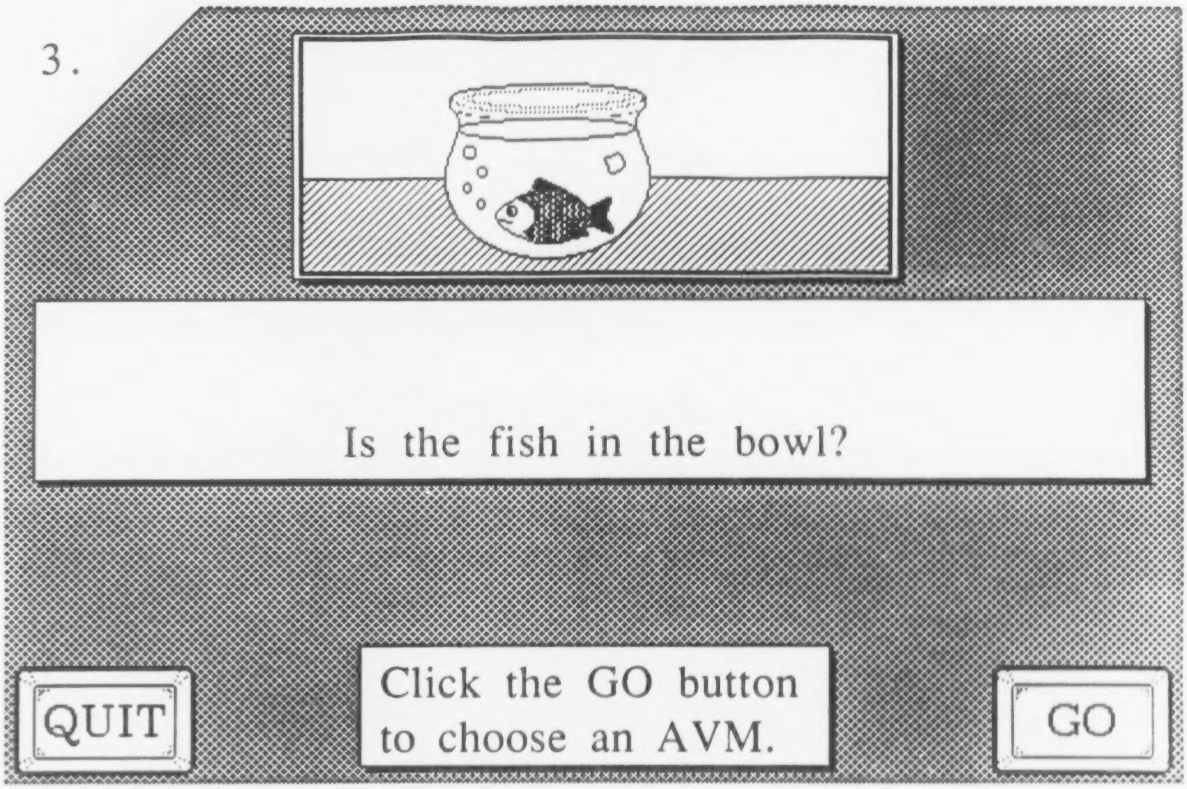
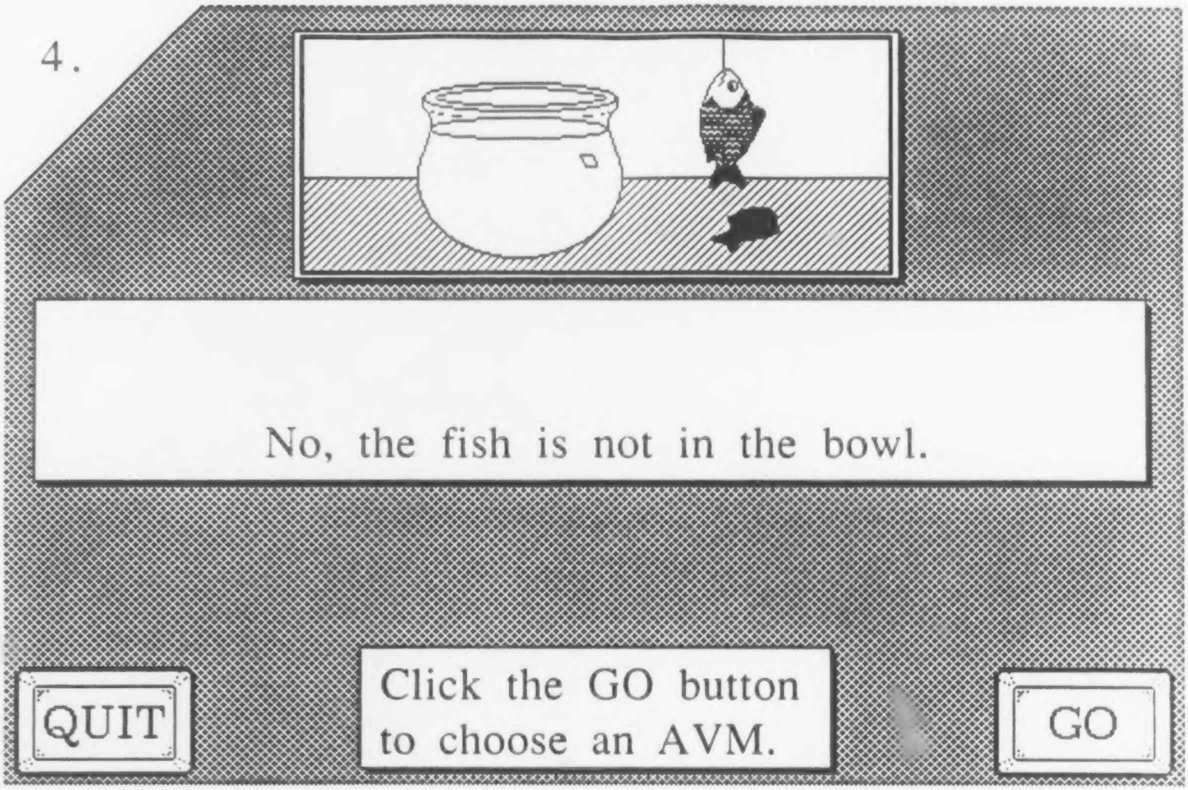
3.


Is the fish in the bowl?

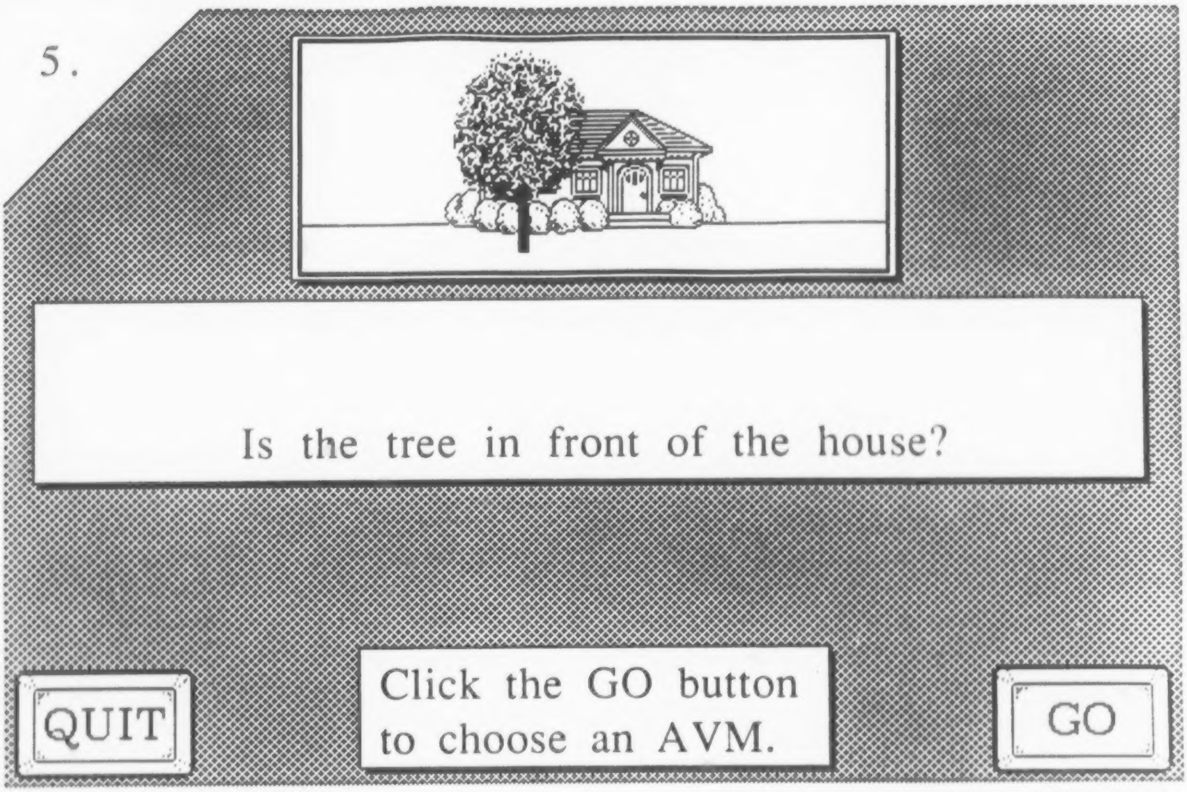
Click the GO button to choose an AVM.

4.


No, the fish is not in the bowl.

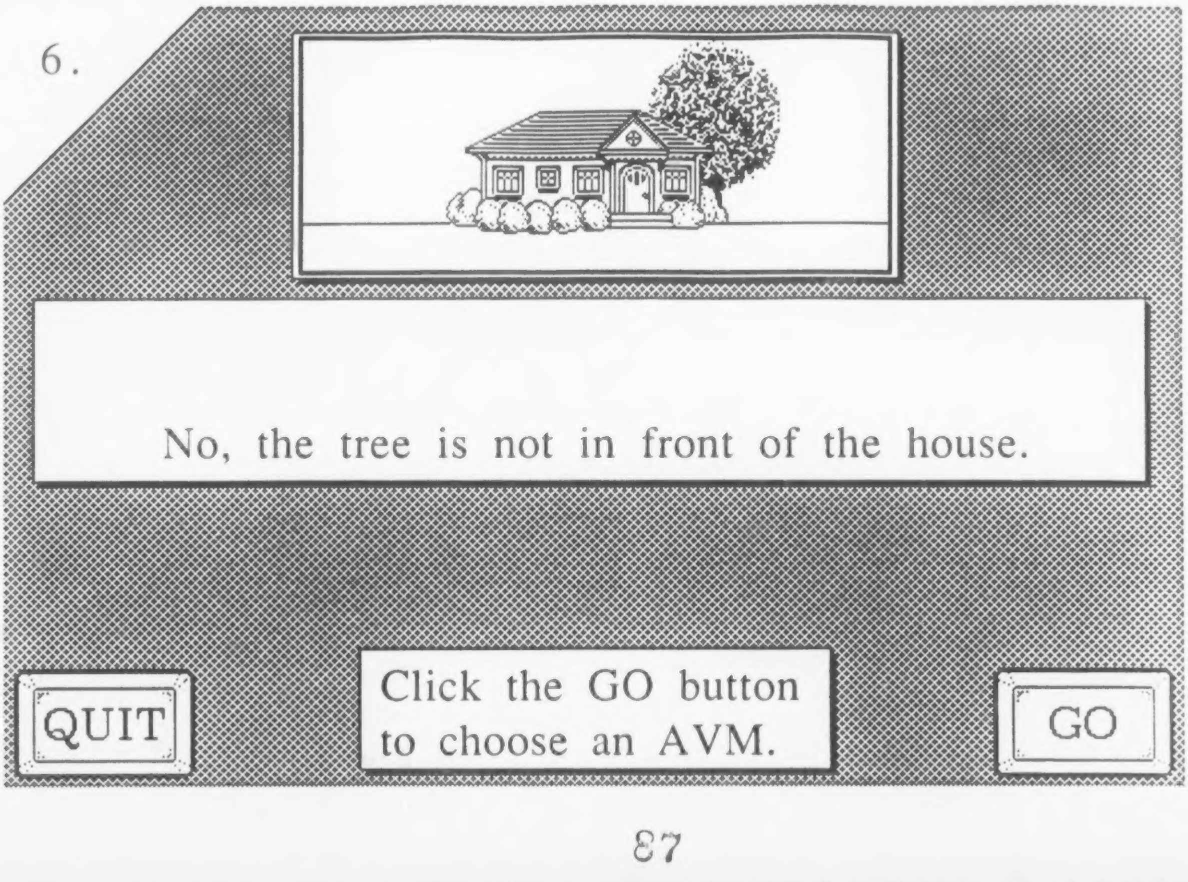
Click the GO button to choose an AVM.

5.


Is the tree in front of the house?

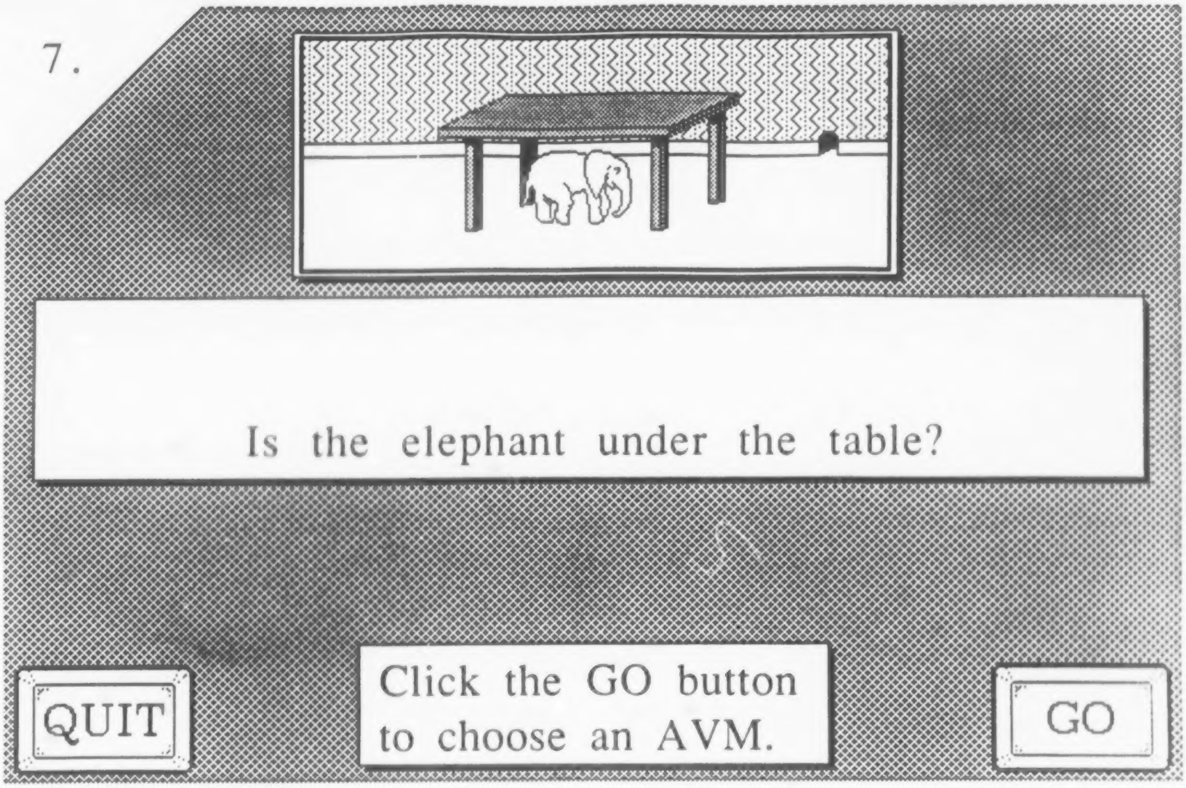
Click the GO button to choose an AVM.

6.


No, the tree is not in front of the house.

Click the GO button to choose an AVM.

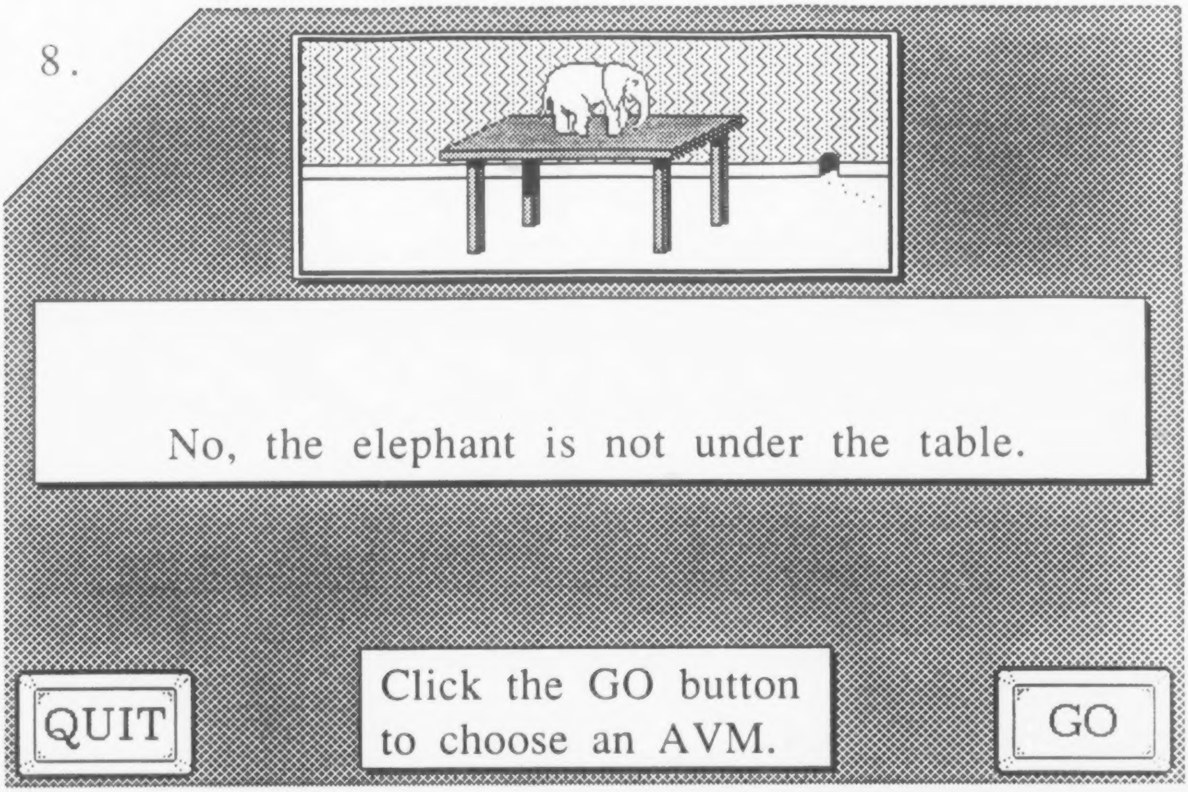
7.



Is the elephant under the table?

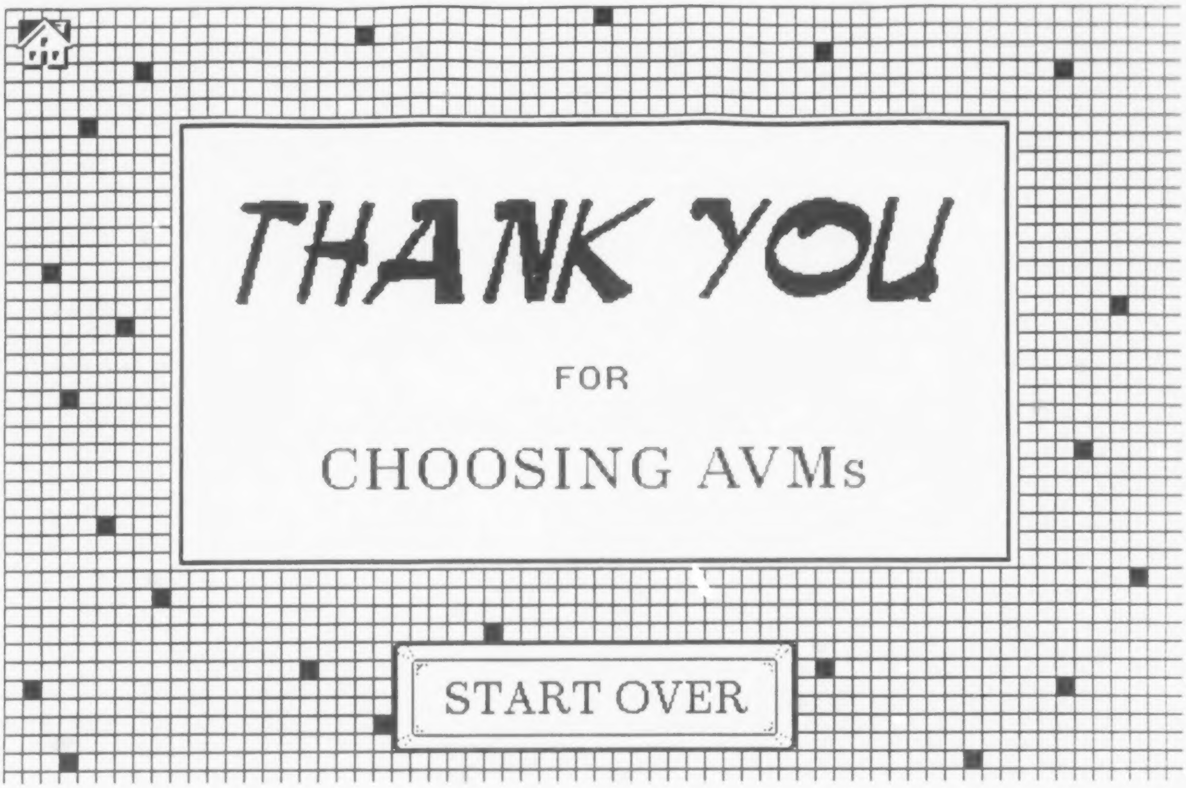
Click the GO button to choose an AVM.

8.



No, the elephant is not under the table.

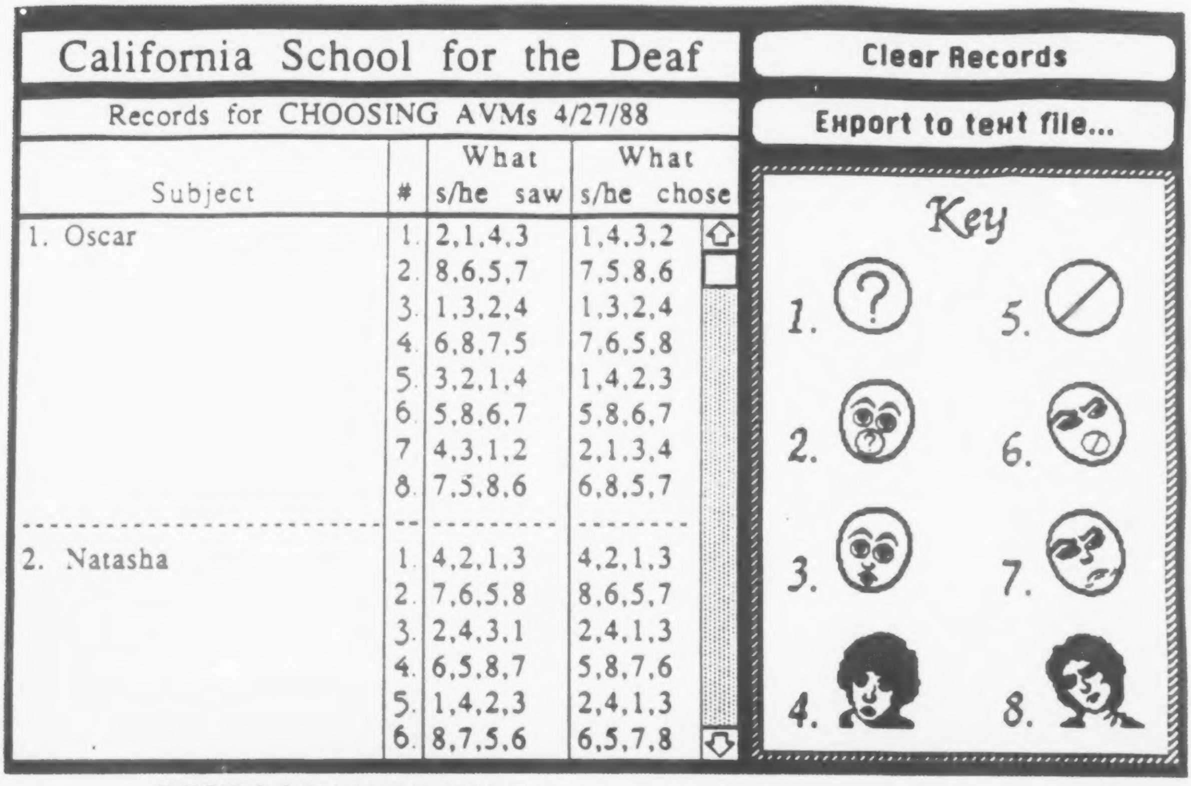
Click the GO button to choose an AVM.



THANK YOU

FOR

CHOOSING AVMs



California School for the Deaf

Records for CHOOSING AVMs 4/27/88

Subject	#	What s/he saw	What s/he chose
1. Oscar	1.	2,1,4,3	1,4,3,2
	2.	8,6,5,7	7,5,8,6
	3.	1,3,2,4	1,3,2,4
	4.	6,8,7,5	7,6,5,8
	5.	3,2,1,4	1,4,2,3
	6.	5,8,6,7	5,8,6,7
	7	4,3,1,2	2,1,3,4
	8.	7,5,8,6	6,8,5,7
2. Natasha	1.	4,2,1,3	4,2,1,3
	2.	7,6,5,8	8,6,5,7
	3.	2,4,3,1	2,4,1,3
	4.	6,5,8,7	5,8,7,6
	5.	1,4,2,3	2,4,1,3
	6.	8,7,5,6	6,5,7,8

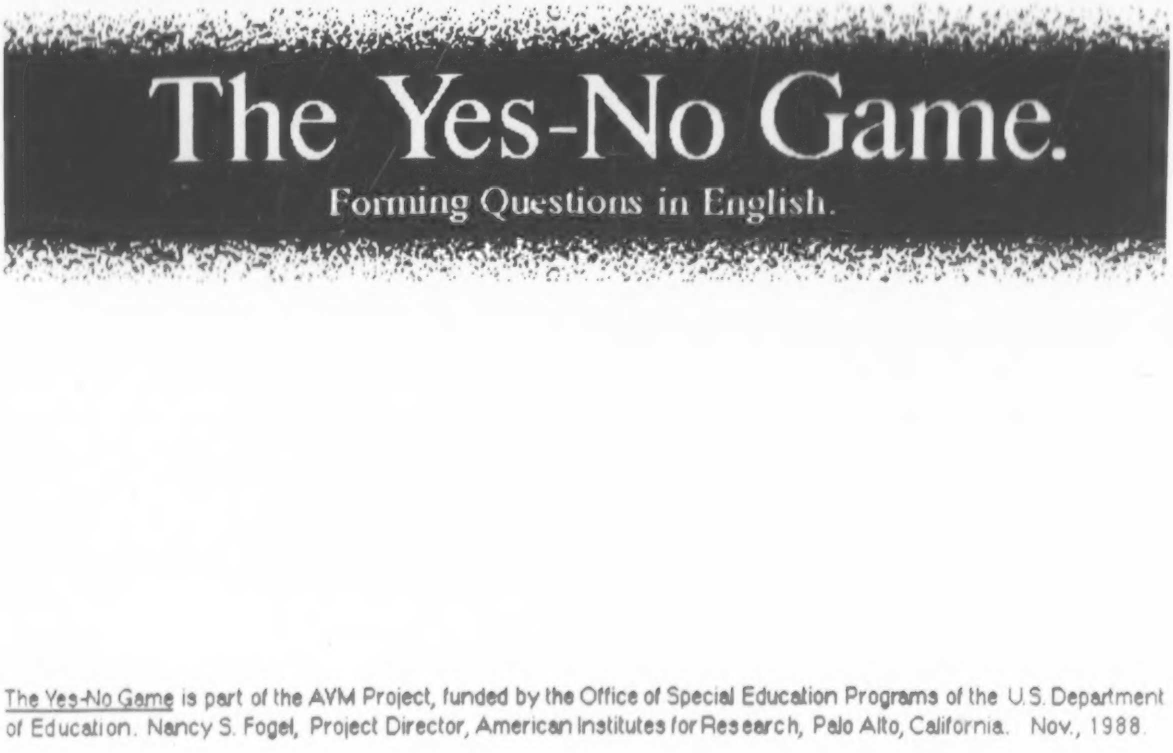
Clear Records
Export to text file...
Key
1.
2.
3.
4.
5.
6.
7.
8.

APPENDIX 4

The Yes-No Game

Sample screens

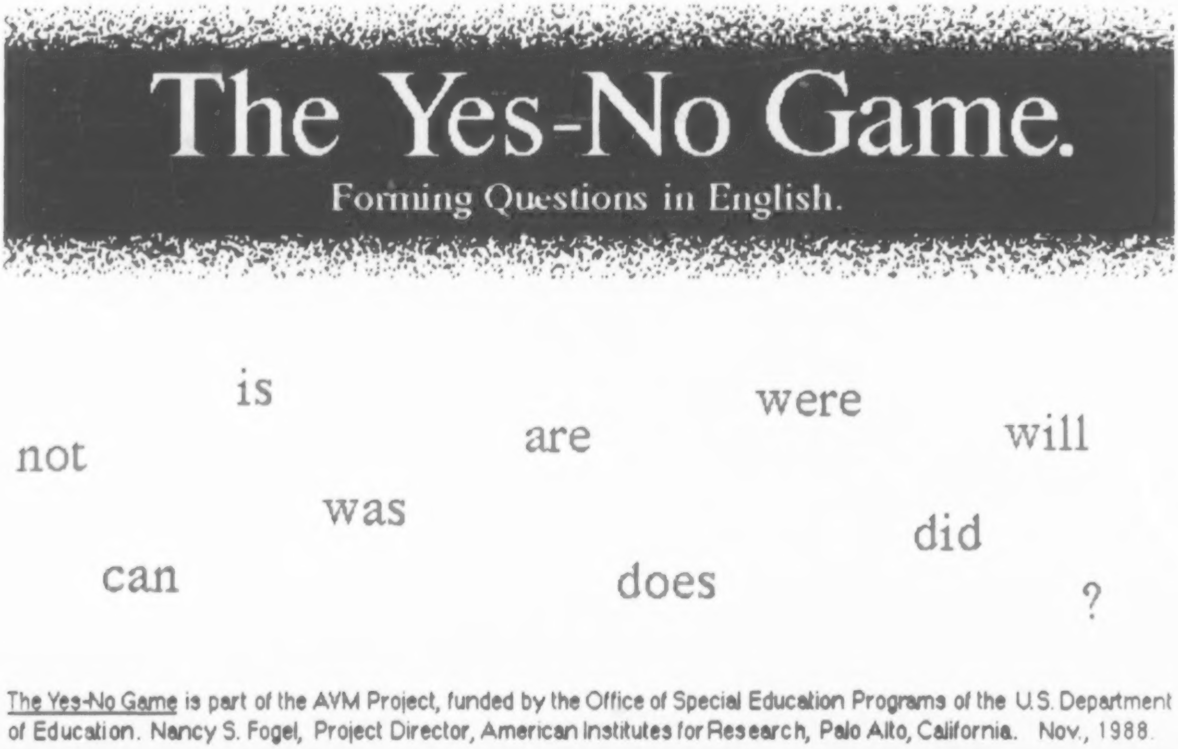
Structure and promotion in *Yes-No I* lessons
Error checking and feedback in *Yes-No I*
Structure and promotion in *Yes-No II* lessons
Error checking and feedback in *Yes-No II*
Suggested improvements for the implementation of *The Yes-No Game*



The Yes-No Game.

Forming Questions in English.

The Yes-No Game is part of the AVM Project, funded by the Office of Special Education Programs of the U.S. Department of Education. Nancy S. Fogel, Project Director, American Institutes for Research, Palo Alto, California. Nov., 1988.



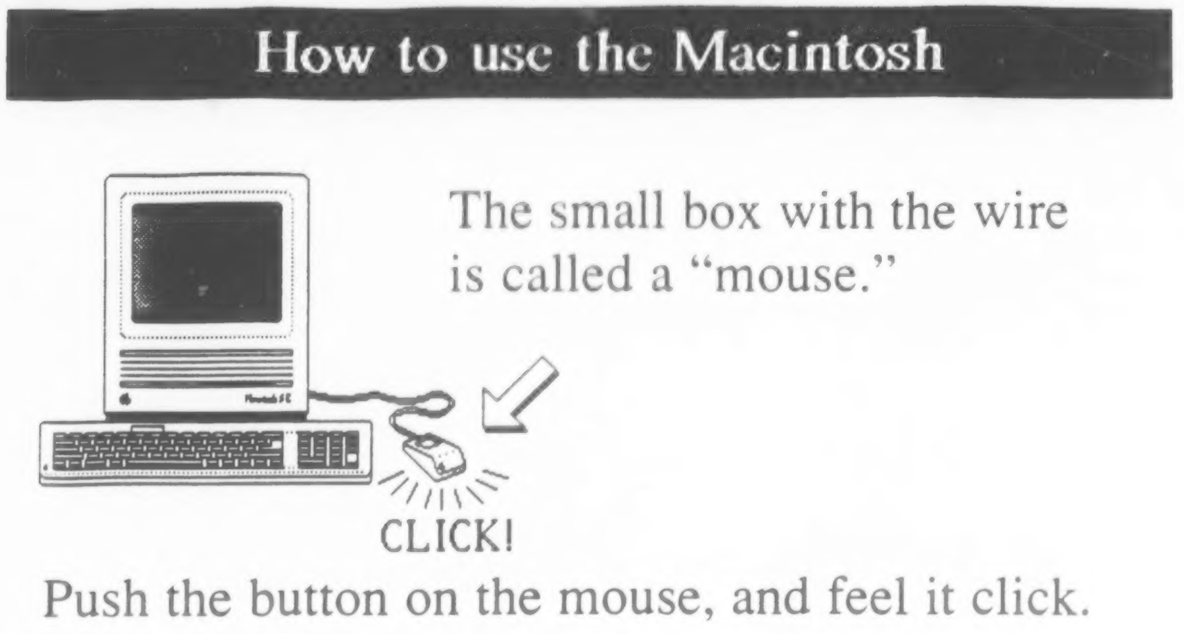
The Yes-No Game.

Forming Questions in English.

The Yes-No Game is part of the AVM Project, funded by the Office of Special Education Programs of the U.S. Department of Education. Nancy S. Fogel, Project Director, American Institutes for Research, Palo Alto, California. Nov., 1988.

Note: The screens shown in this booklet are actual printouts at the Macintosh's display resolution. The title screen above displays words scrolling by; these verbs and modals are key elements in building English questions. The scrolling continues until a key is pressed or the mouse is clicked.

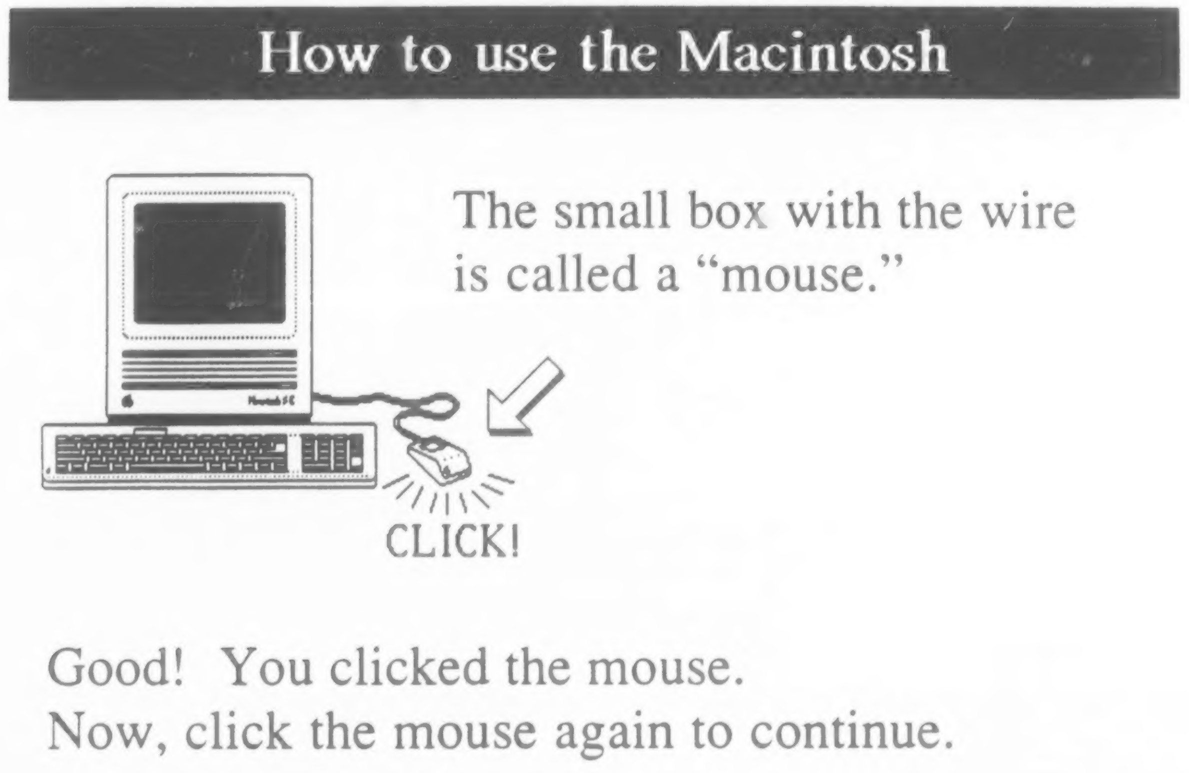
BEST COPY AVAILABLE



How to use the Macintosh

The small box with the wire is called a "mouse."

Push the button on the mouse, and feel it click.

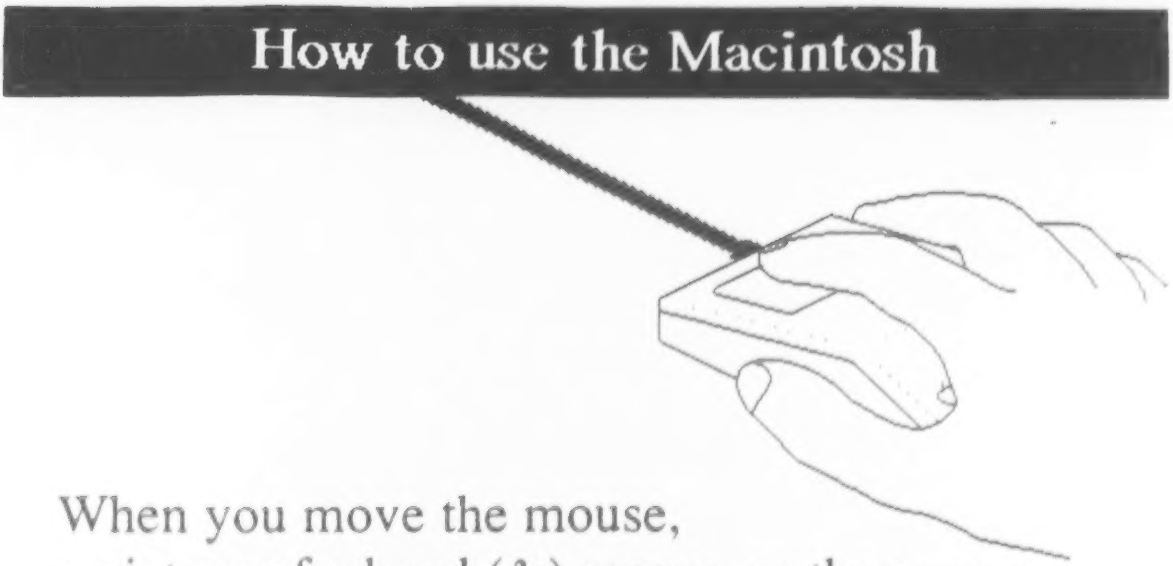


How to use the Macintosh

The small box with the wire is called a "mouse."

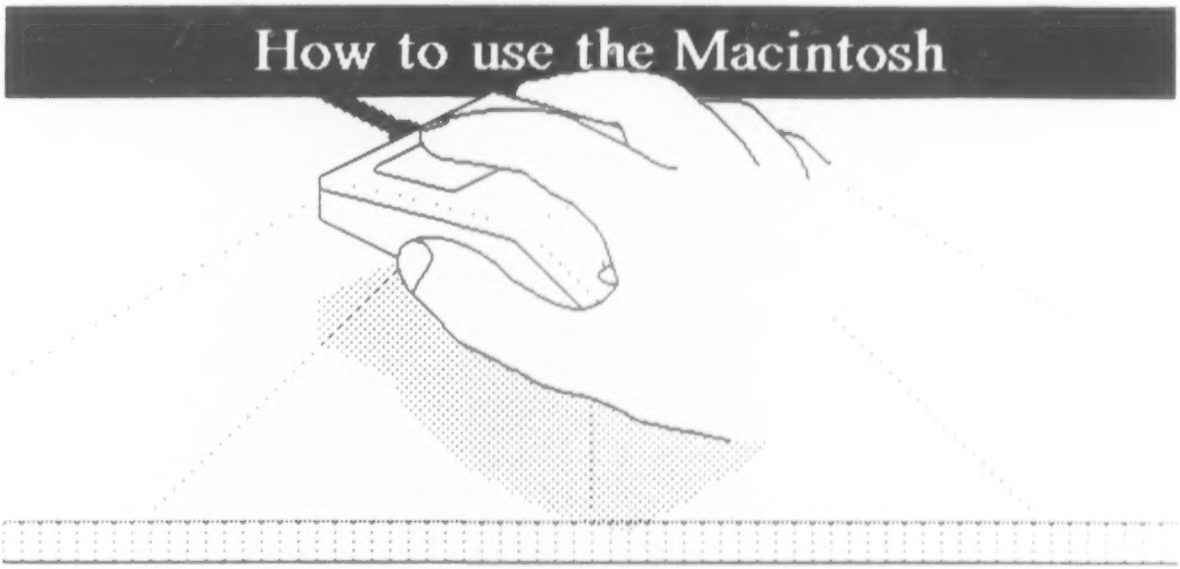
Good! You clicked the mouse.
Now, click the mouse again to continue.

Note: The first time learners use the program, they have a lesson on using the Macintosh. Graphics and movies illustrate clicking and positioning the mouse..


How to use the Macintosh

When you move the mouse,
a picture of a hand (☝) moves on the screen.

Practice using the mouse to move the hand
around the screen.

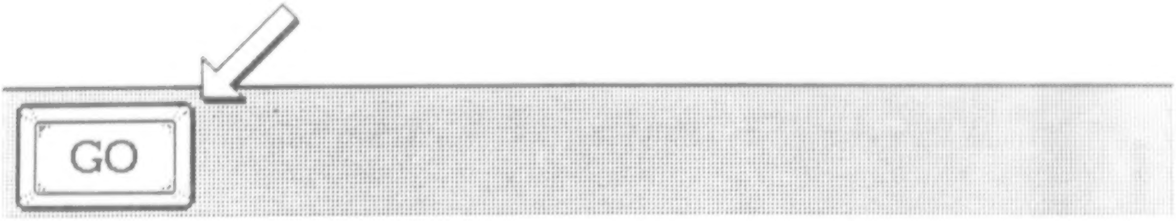

How to use the Macintosh

If the mouse reaches the edge of the pad,
pick up the mouse.
Put the mouse down in the middle of the pad.

How to use the Macintosh

At the bottom of the screen is a GO button.

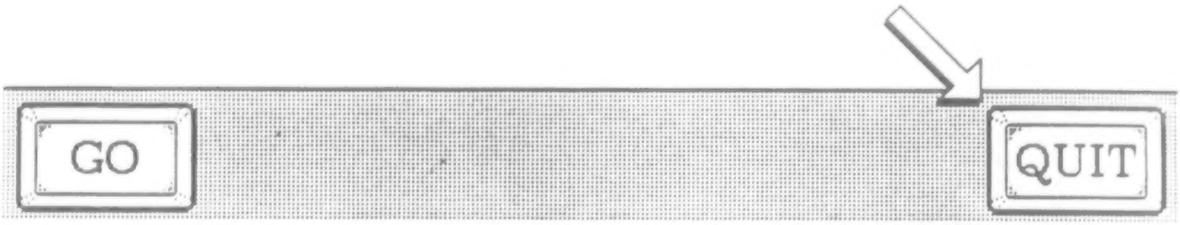
Move the hand to the GO button,
and click the mouse.

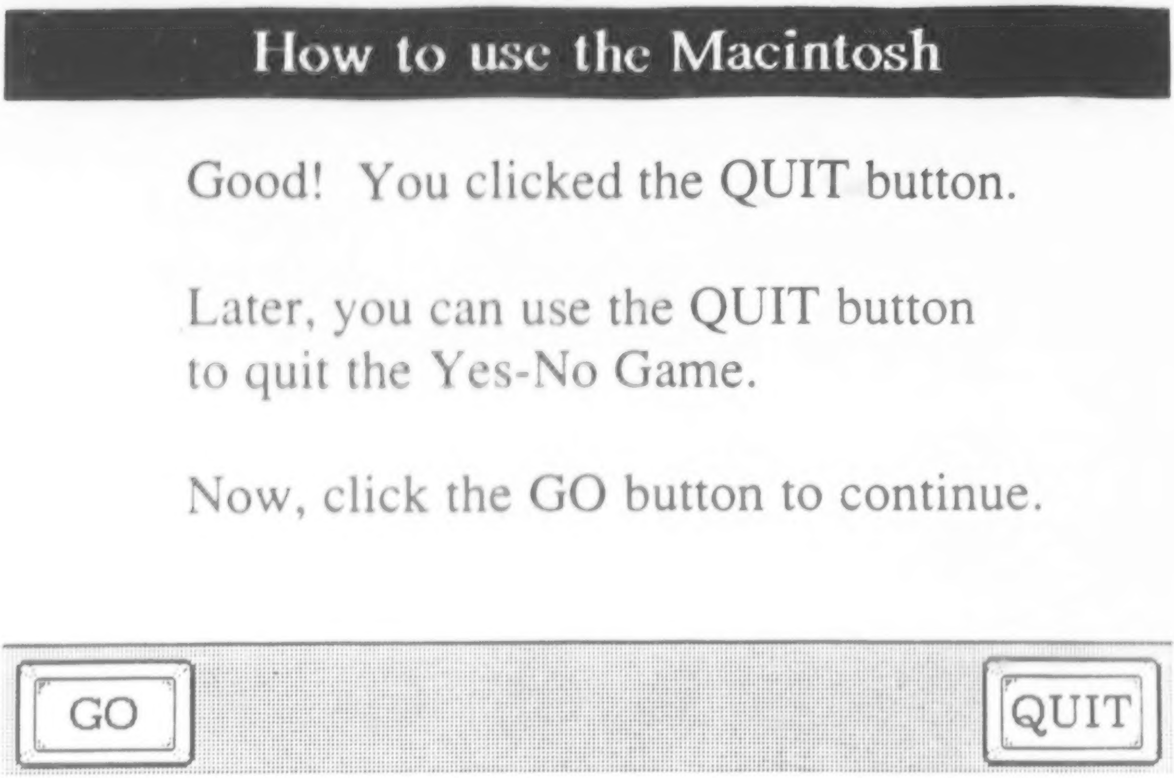


How to use the Macintosh

Find the QUIT button.

Move the hand to the QUIT button,
and click it.



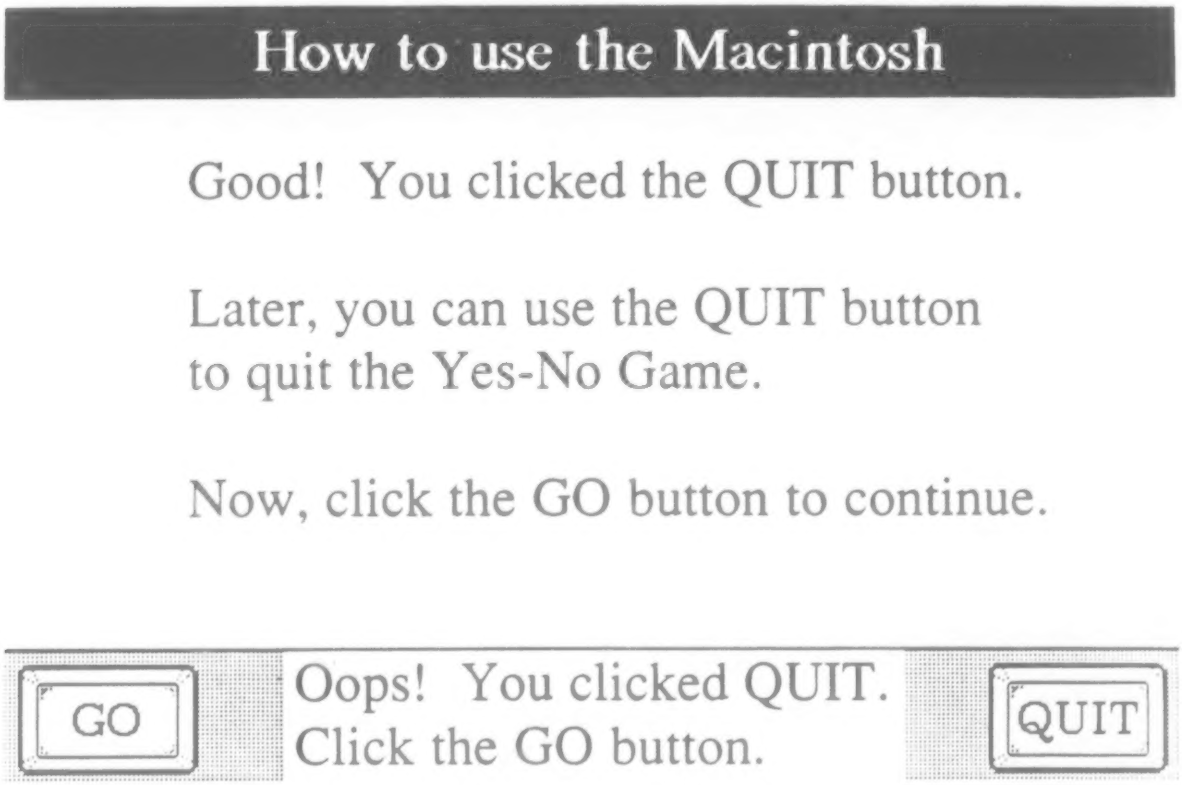


How to use the Macintosh

Good! You clicked the QUIT button.

Later, you can use the QUIT button
to quit the Yes-No Game.

Now, click the GO button to continue.



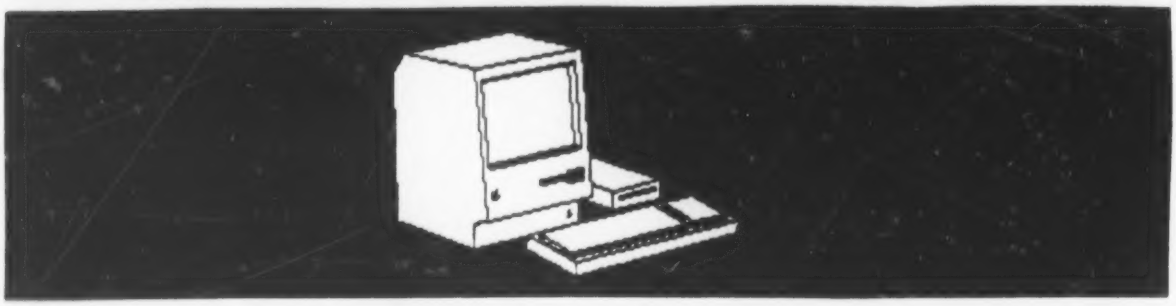
How to use the Macintosh

Good! You clicked the QUIT button.

Later, you can use the QUIT button
to quit the Yes-No Game.

Now, click the GO button to continue.

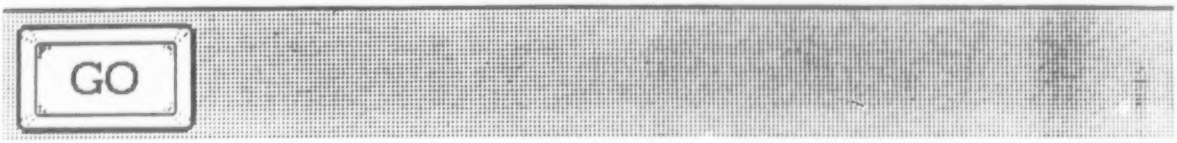
Oops! You clicked QUIT.
Click the GO button.



Now you know the Macintosh,
but the Macintosh does not know you.

Please type your name, and click the GO button.

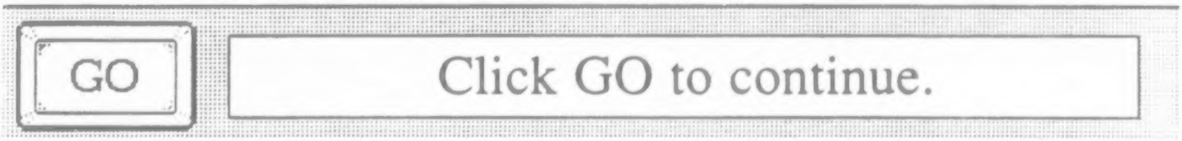
My name is



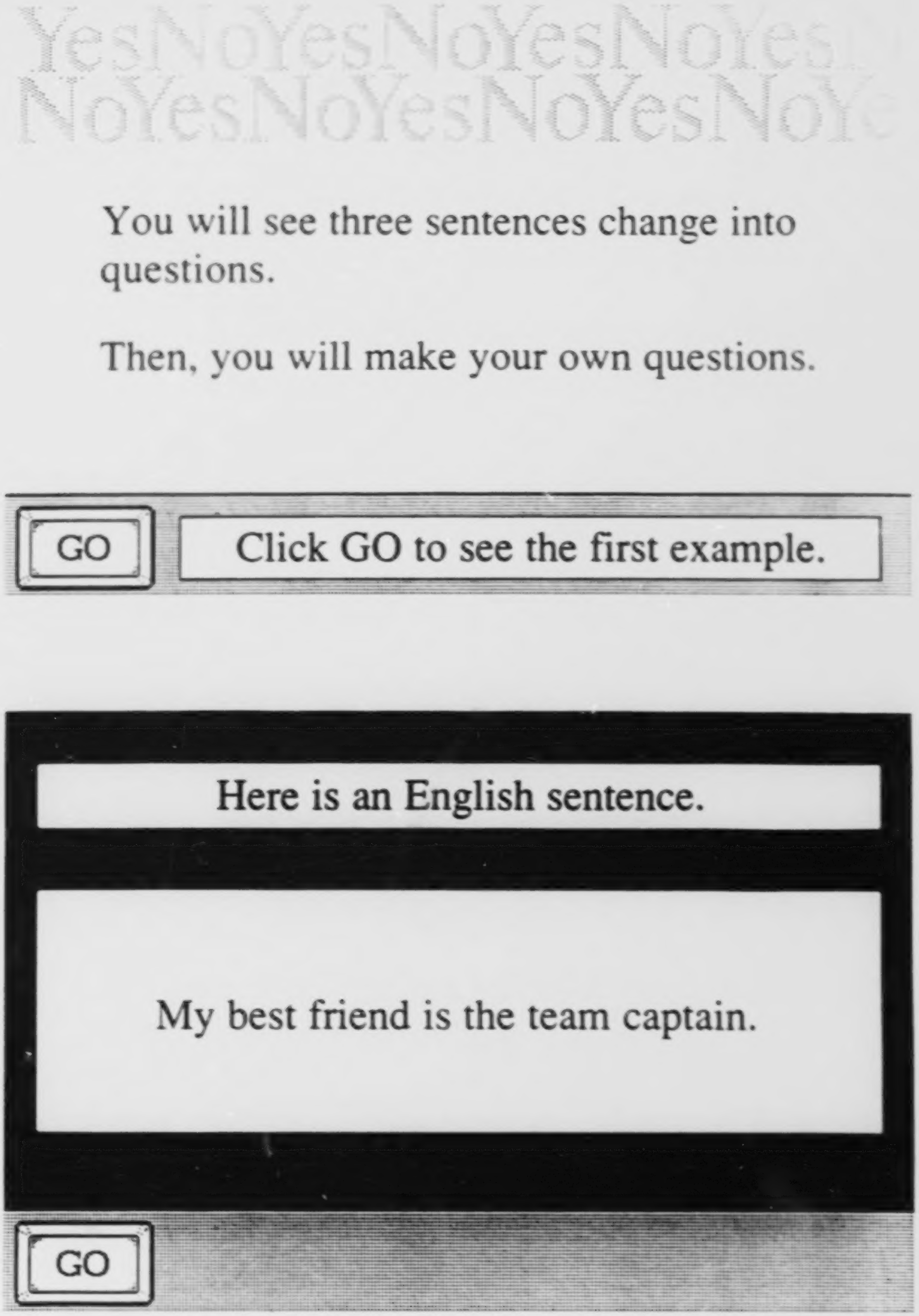
YesNoYesNoYesNoYes
NoYesNoYesNoYesNoYe

Hi, Ludwig van Beethoven!

In the Yes-No Game, you will make
questions in English.



Click GO to continue.


YesNoYesNoYesNoYes
NoYesNoYesNoYesNoYe
GO
GO

You will see three sentences change into questions.

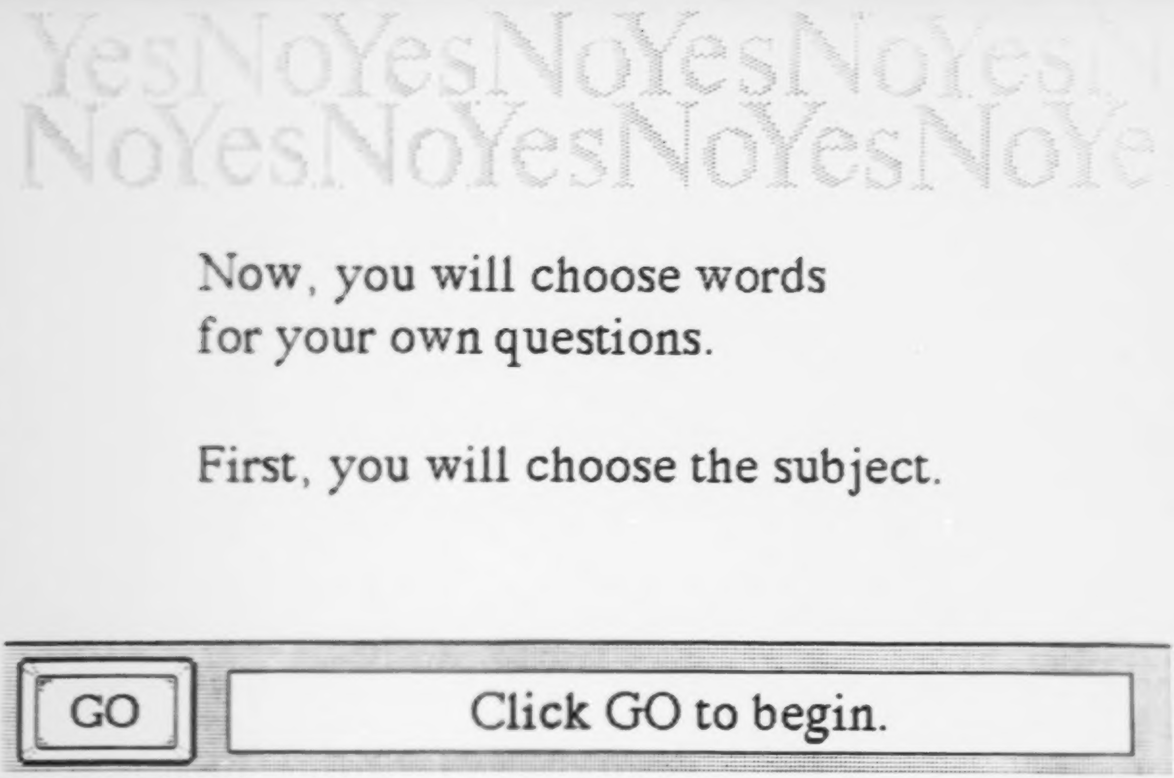
Then, you will make your own questions.

Click GO to see the first example.

Here is an English sentence.

My best friend is the team captain.

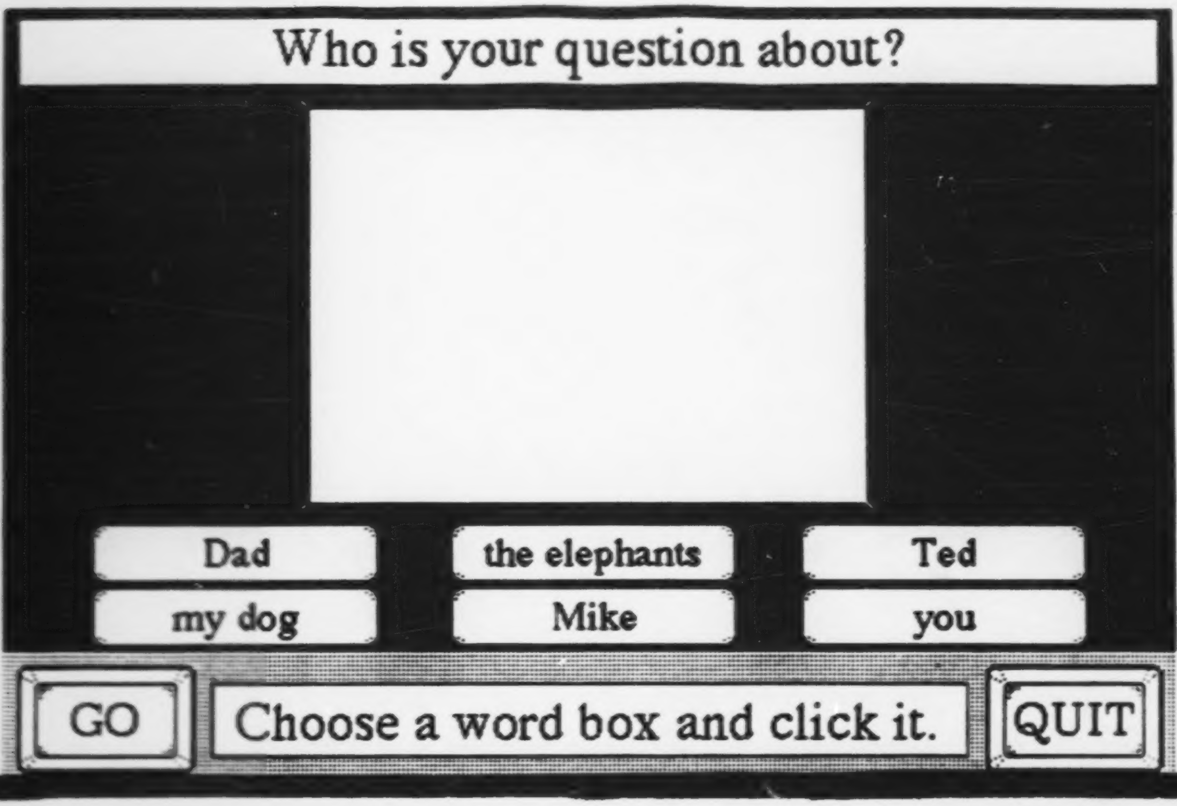
BEST COPY AVAILABLE


YesNoYesNoYesNoYesN
NoYesNoYesNoYesNoYe
GO

Now, you will choose words
for your own questions.

First, you will choose the subject.

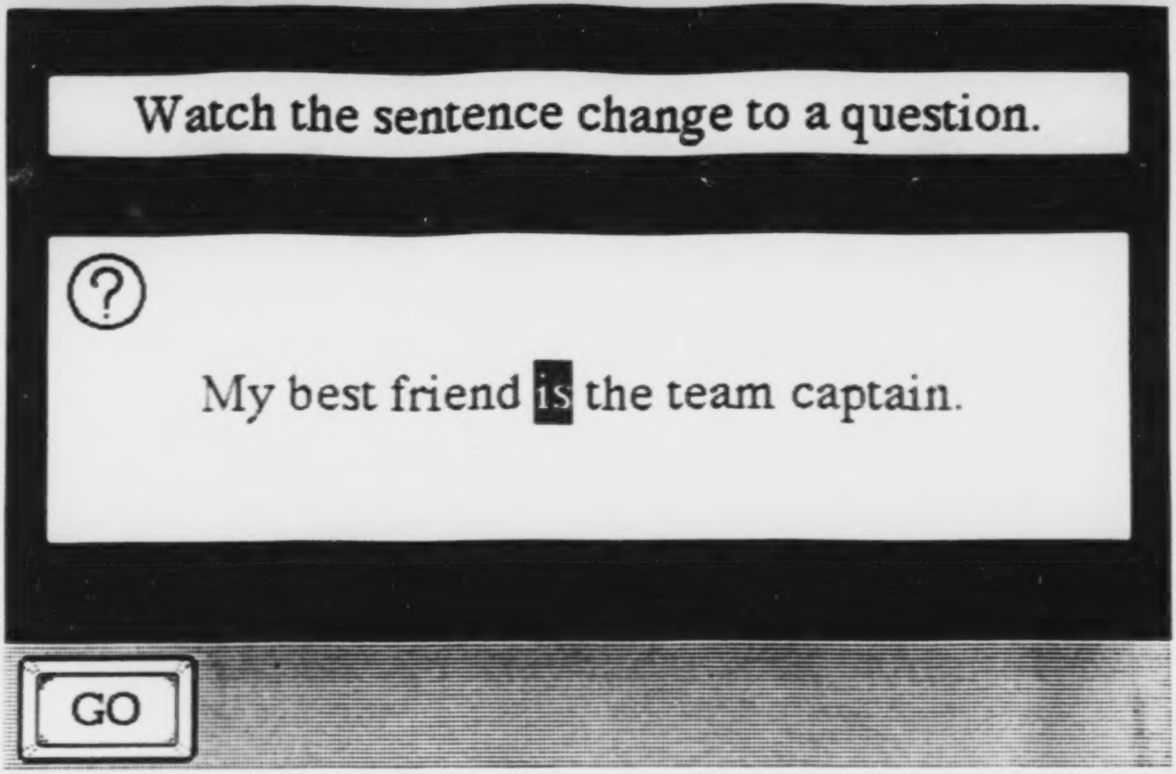
Click GO to begin.


Dad
the elephants
Ted
my dog
Mike
you
GO
QUIT

Who is your question about?

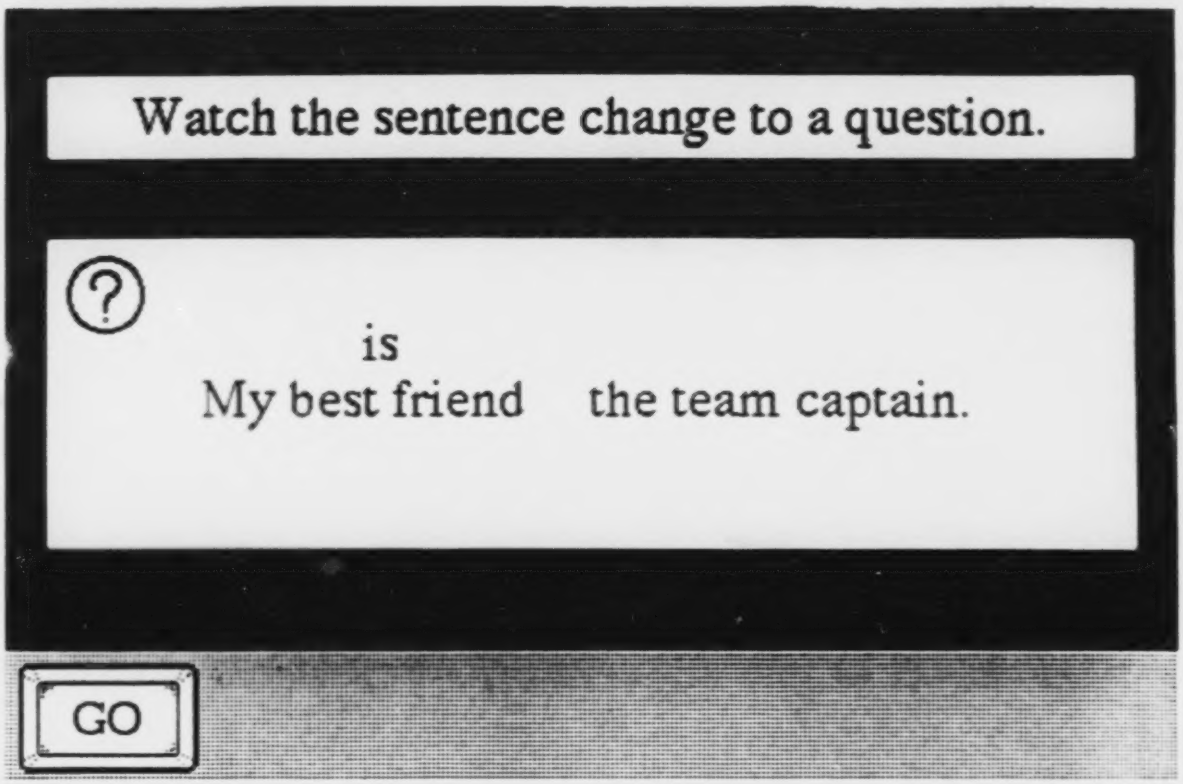
Choose a word box and click it.

Note: Learners are shown how they can build their own sentences and questions; they become active participants in their own instruction, rather than passive viewers of a presentation. The program is capable of generating the graphics to accompany any of the thousands of sentences learners can create. Some of them are funny, which helps to engage learners and sustain their interest.



Watch the sentence change to a question.

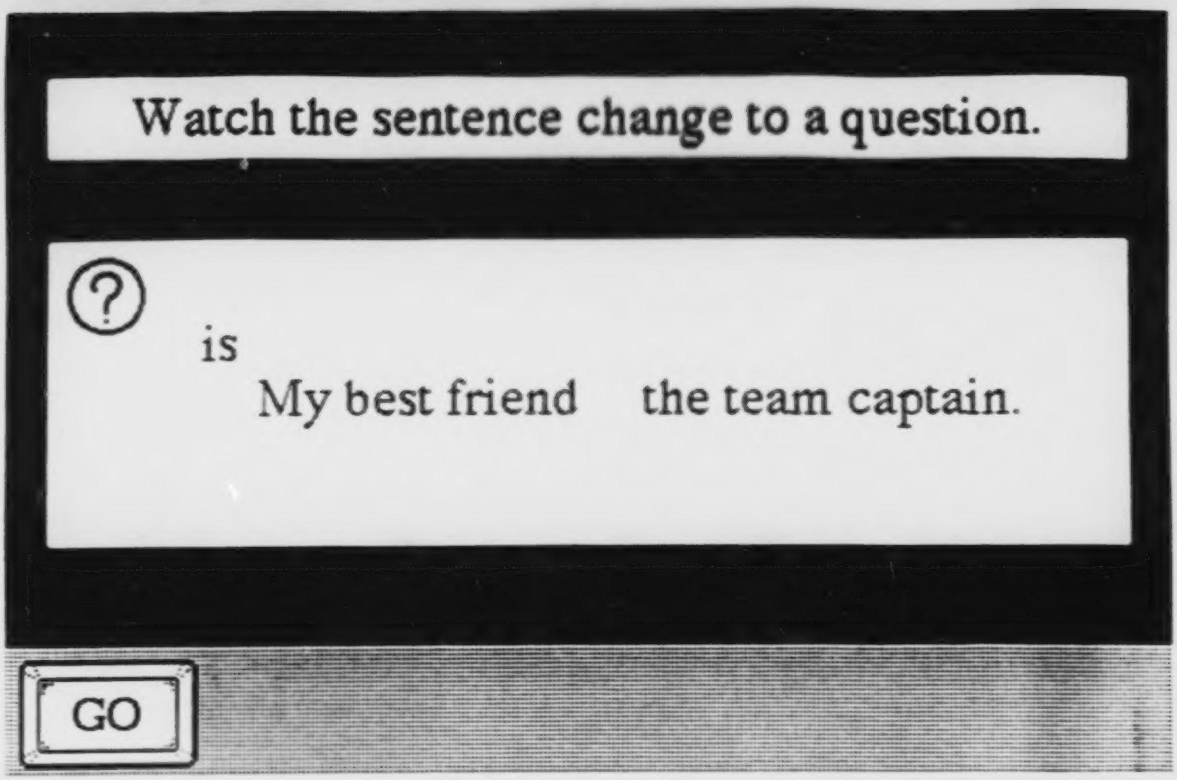
My best friend is the team captain.



Watch the sentence change to a question.

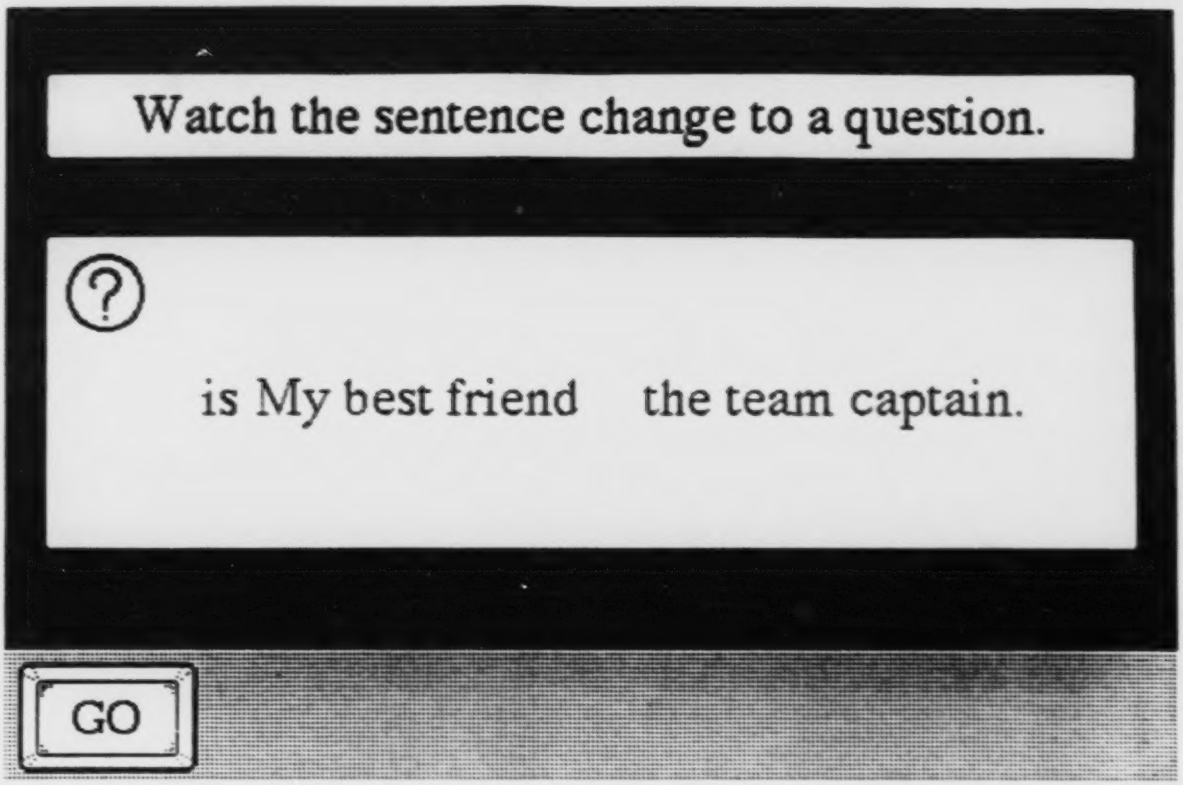
is
My best friend the team captain.

Note: An animated model shows how a simple declarative sentence becomes interrogative through a particular syntactical transformation. This important aspect of the program demonstrates that we do not teach rules; we show "movies" of transformations. This approach builds on the visualization abilities that are well developed in hearing-impaired youth.



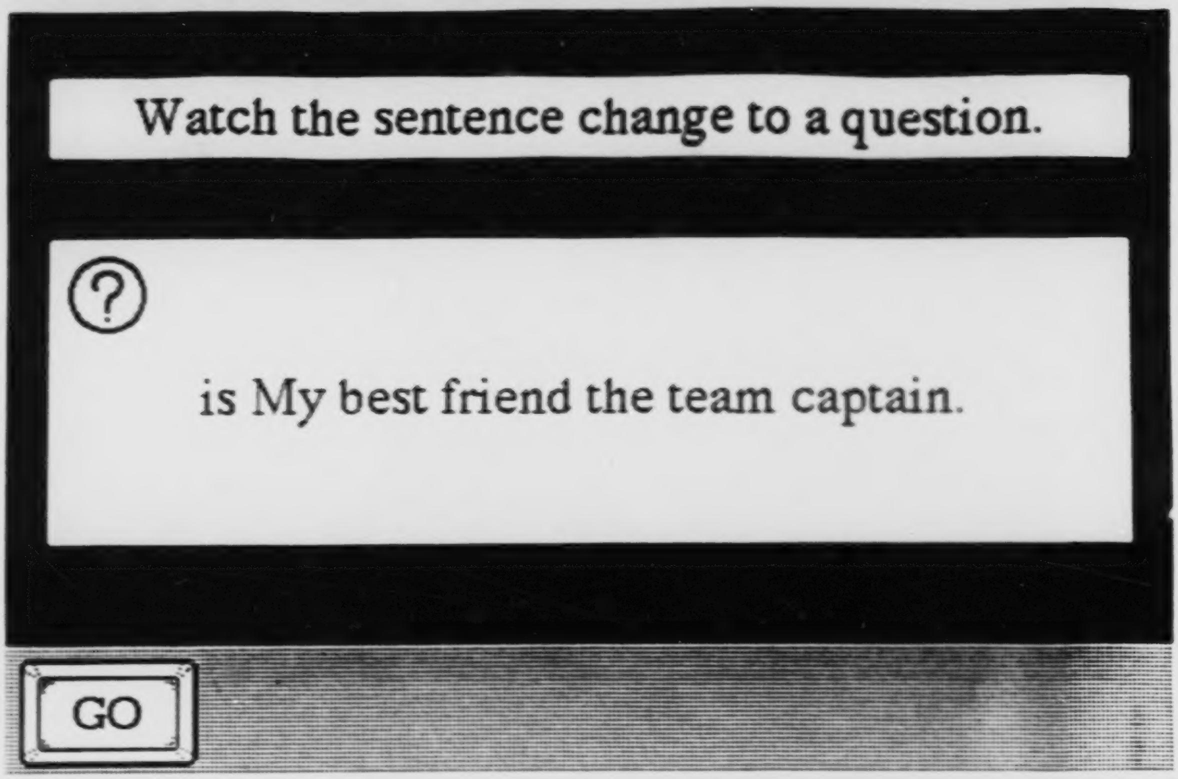
Watch the sentence change to a question.

is
My best friend the team captain.

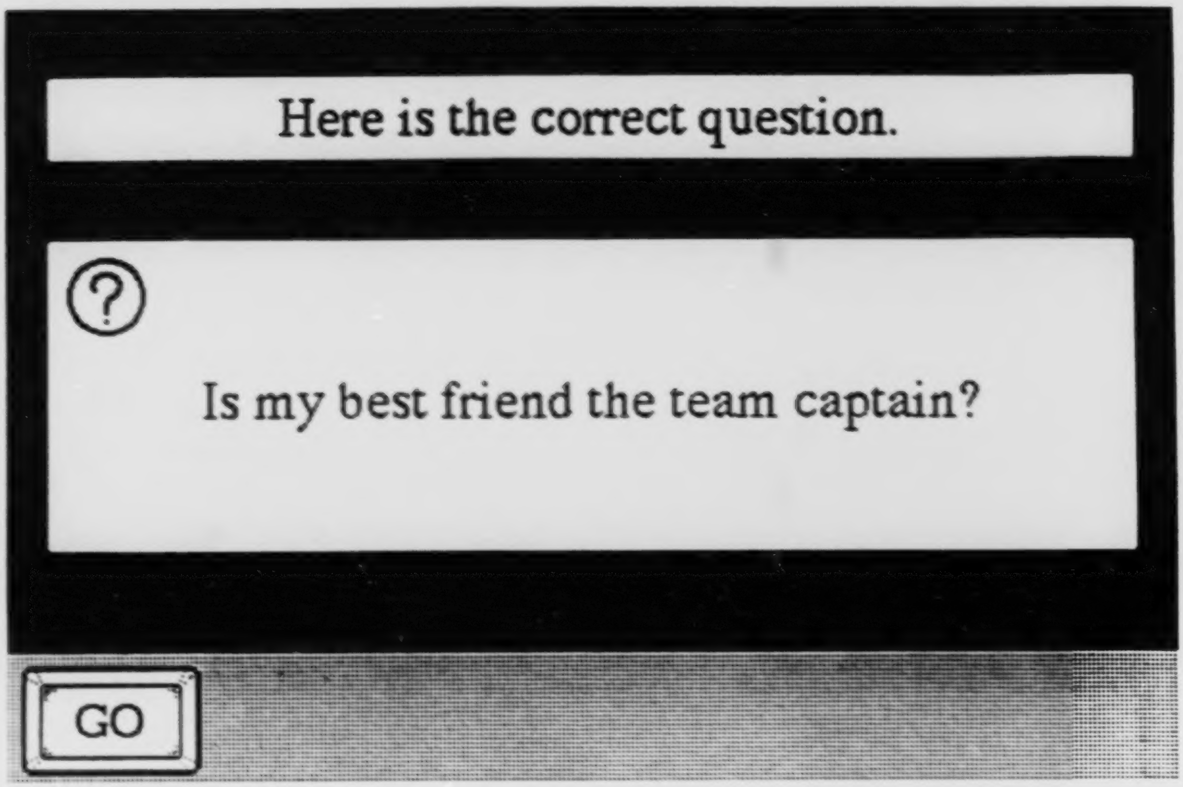


Watch the sentence change to a question.

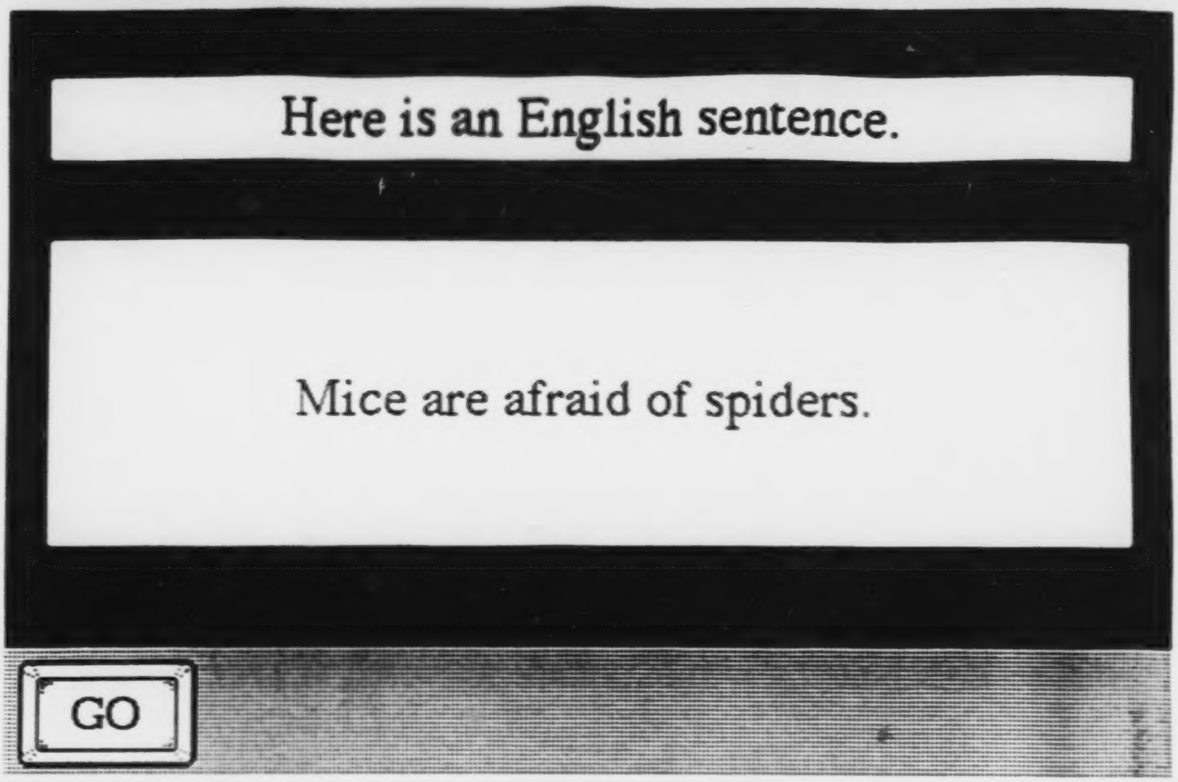
is My best friend the team captain.


Watch the sentence change to a question.

is My best friend the team captain.

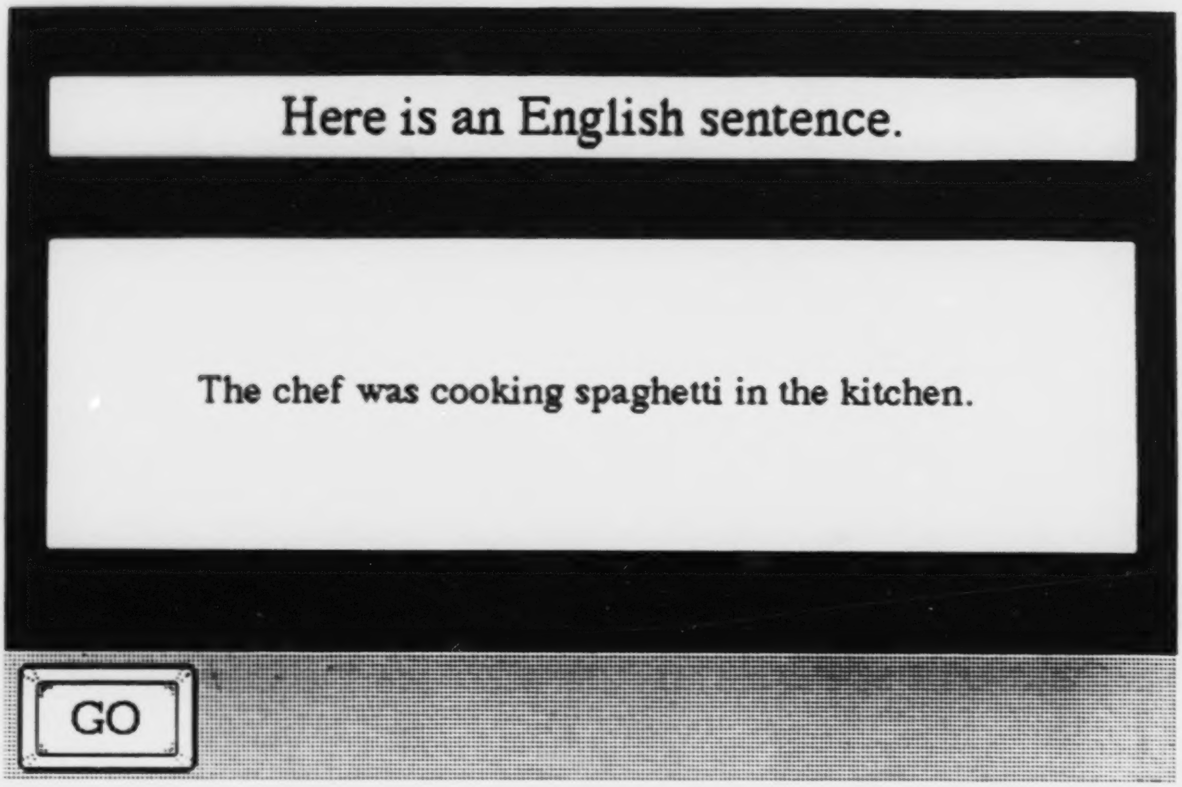

Here is the correct question.

Is my best friend the team captain?



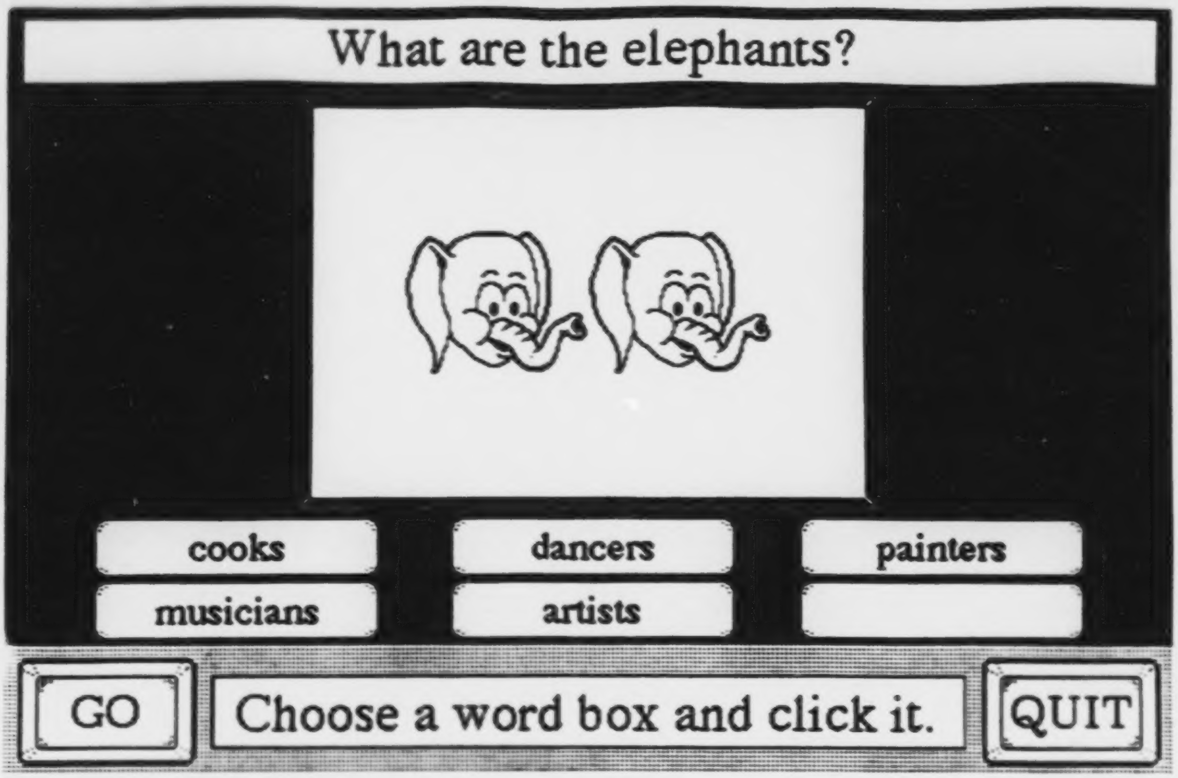
Here is an English sentence.

Mice are afraid of spiders.



Here is an English sentence.

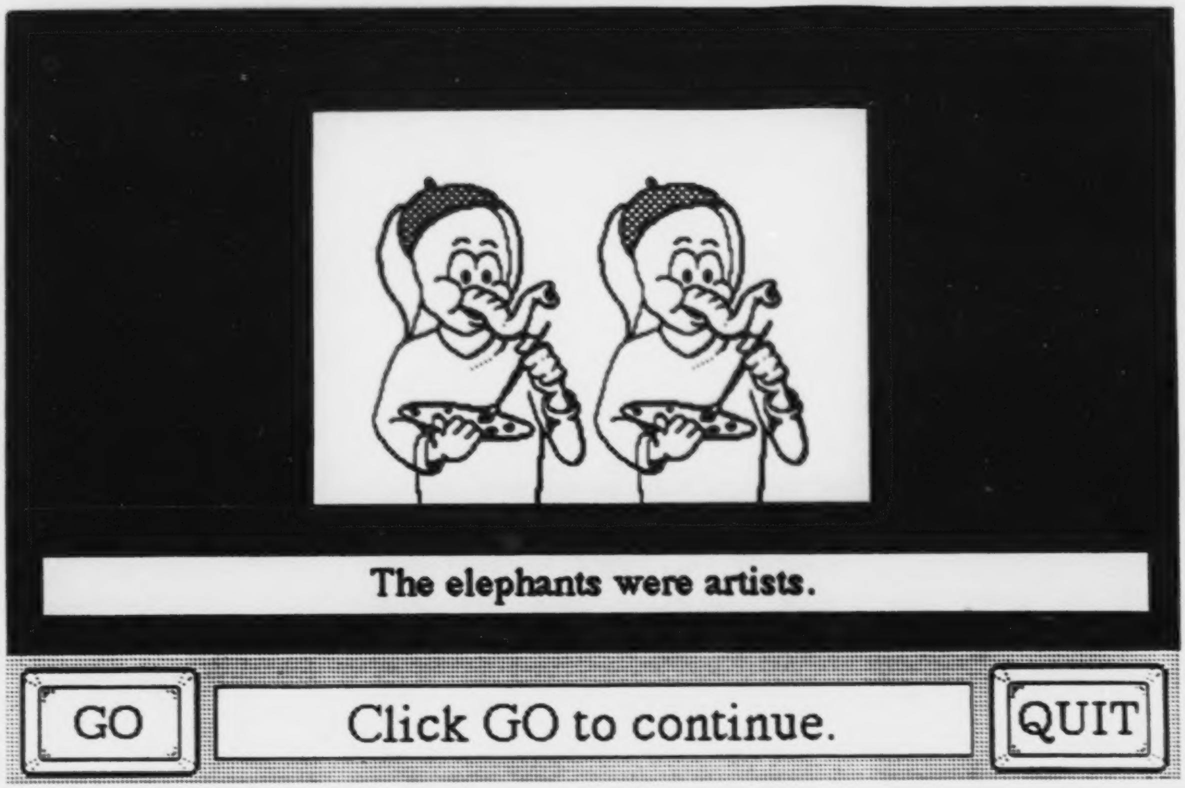
The chef was cooking spaghetti in the kitchen.



What are the elephants?

cooks
dancers
painters
musicians
artists
GO
QUIT

Choose a word box and click it.

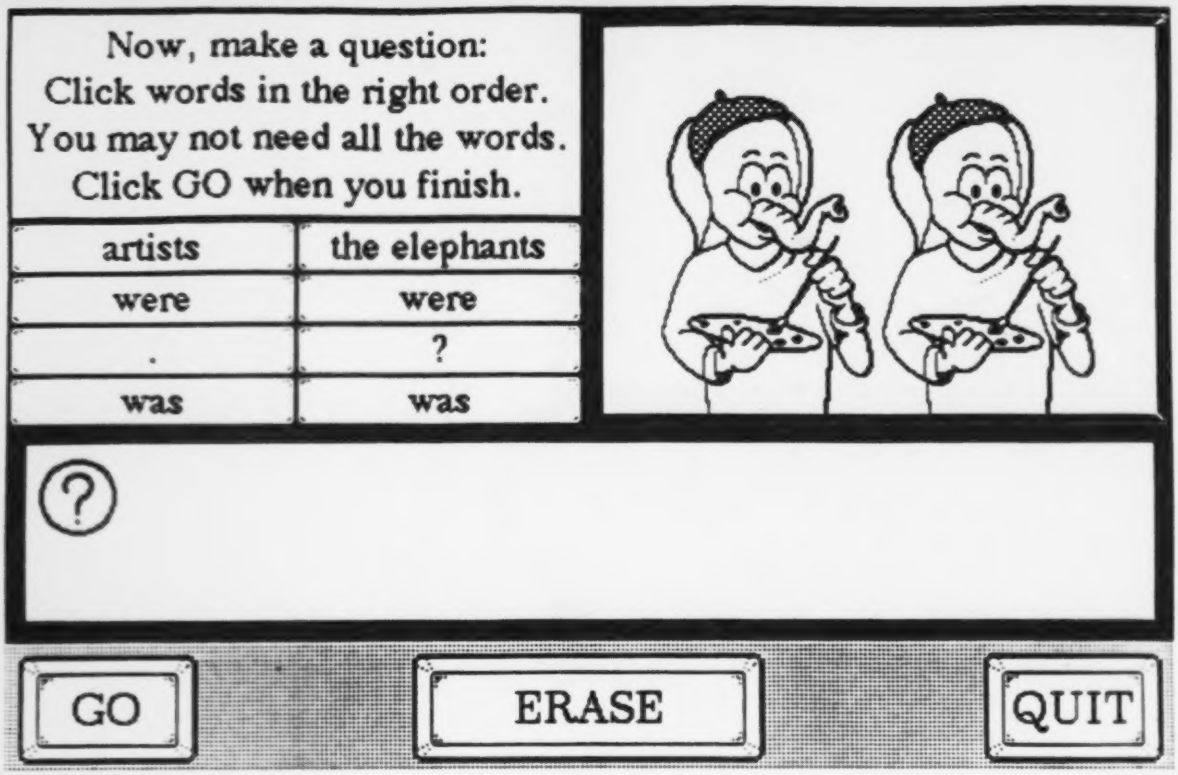


The elephants were artists.

Click GO to continue.

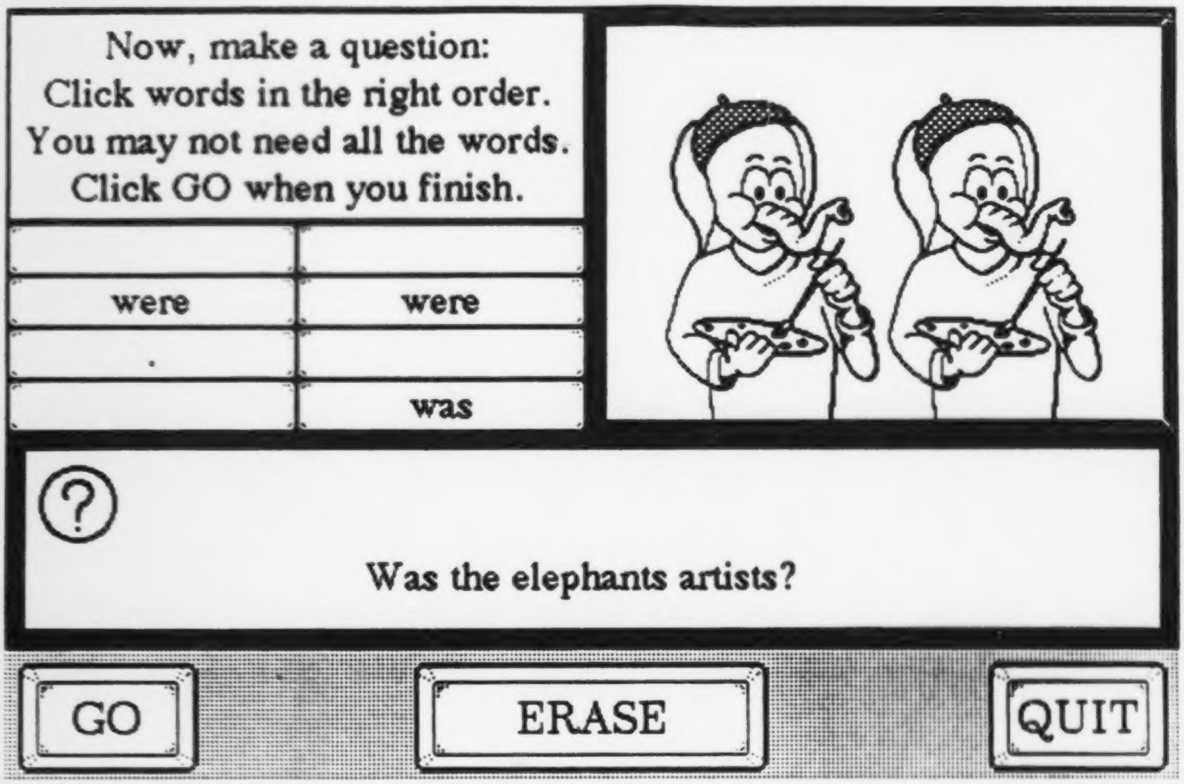
Note: The core instructional module permits learners to transform the sentences they have built into a questions. To form a question, students click the word/phrase boxes in the order which they believe is correct. Normed tests of the syntactic abilities of deaf students provide the basis for expected errors. For each type of sentence structure taught, there are more than 20 common errors for which the program provides tailored corrective feedback. For maximum effectivness, the feedback uses various visualization techniques: graphics, flashing, highlighting, and reverse video.

The illustration (of the semantic content of the sentence) in the upper right corner of the screen serves to compensate for some learners' deficient comprehension skills, which might otherwise interfere with the attempt to teach syntactic skills. Our studies have shown that even learners with low comprehension skills improve their syntactic skills significantly after using this program.



Now, make a question:
Click words in the right order.
You may not need all the words.
Click GO when you finish.

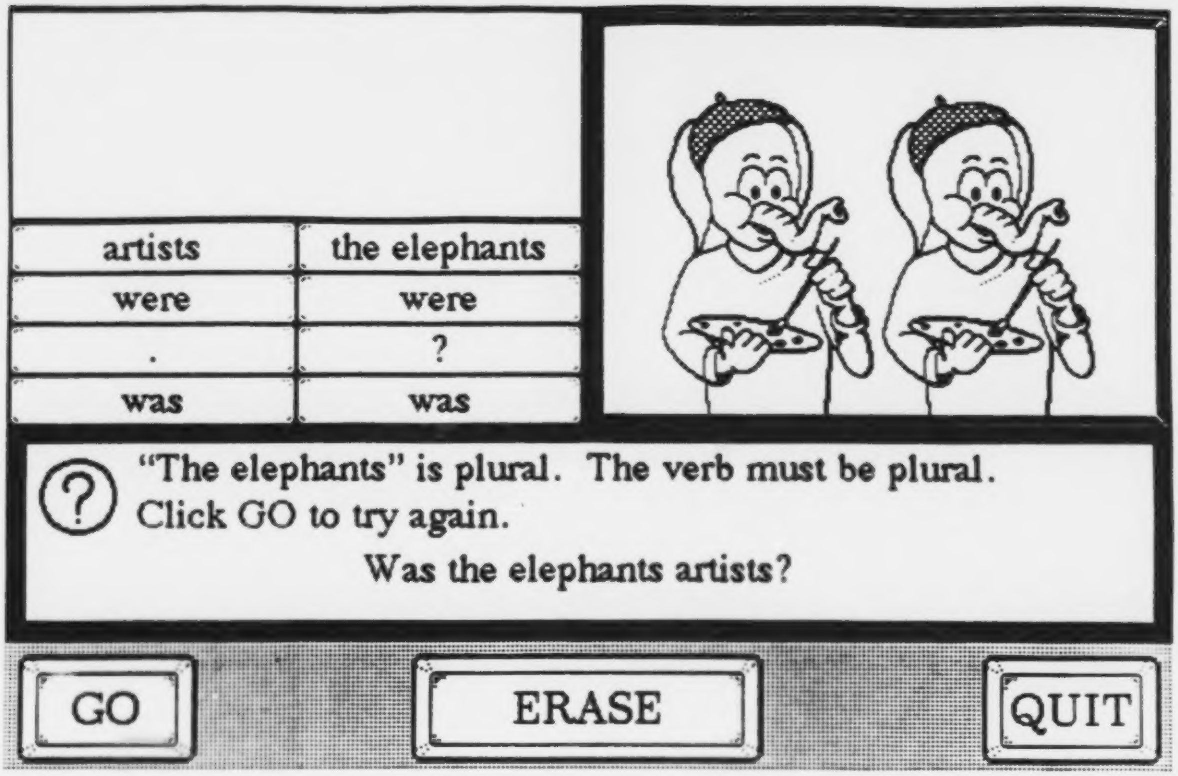
artists
the elephants
were
were
.
?
was
was
?
GO
ERASE
QUIT



Now, make a question:
Click words in the right order.
You may not need all the words.
Click GO when you finish.

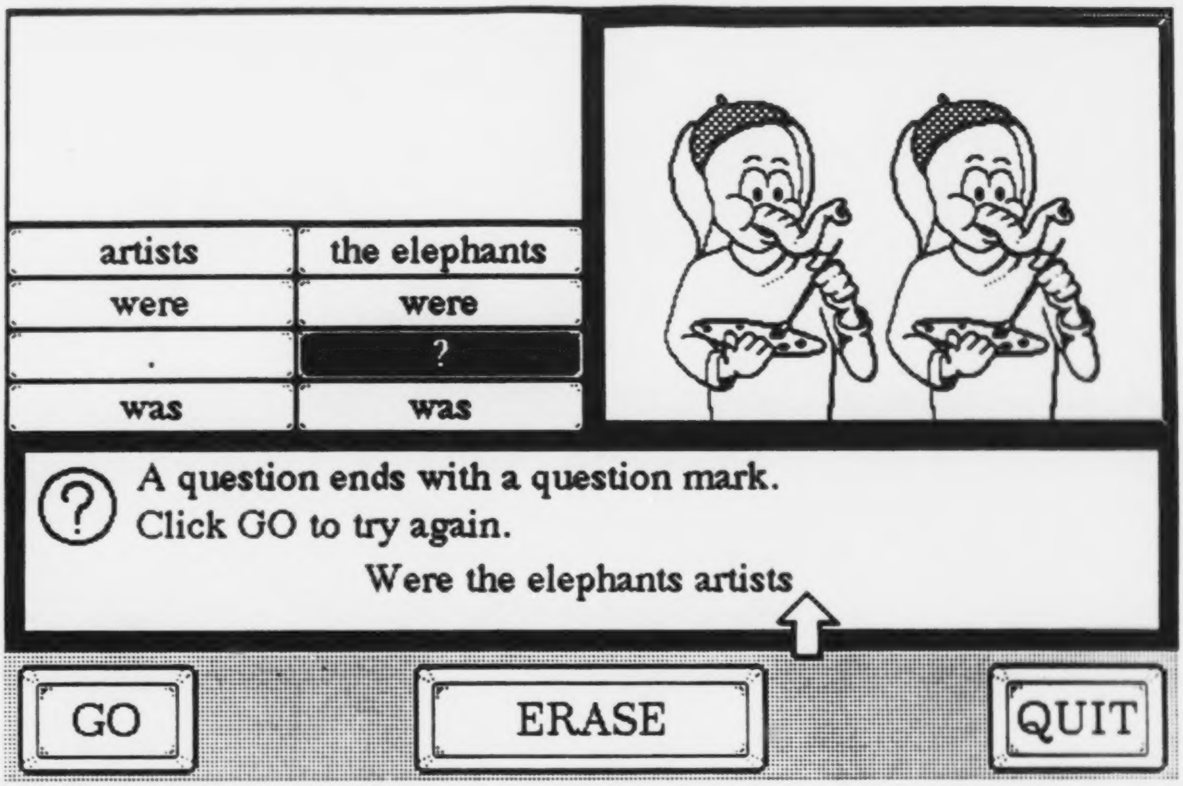
were
were
.
was
?
GO
ERASE
QUIT

Was the elephants artists?


artists
the elephants
were
were
.
?
was
was
GO
ERASE
QUIT

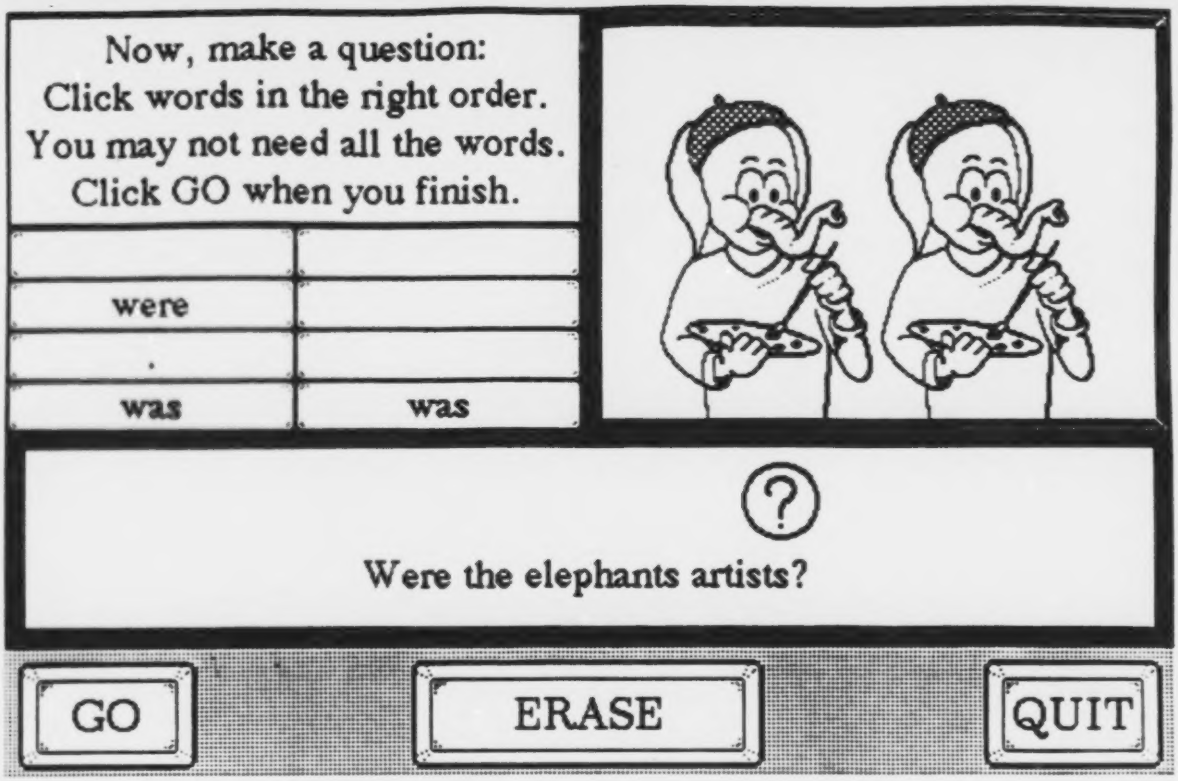
"The elephants" is plural. The verb must be plural.
Click GO to try again.

Was the elephants artists?


artists
the elephants
were
were
.
?
was
was
GO
ERASE
QUIT

A question ends with a question mark.
Click GO to try again.

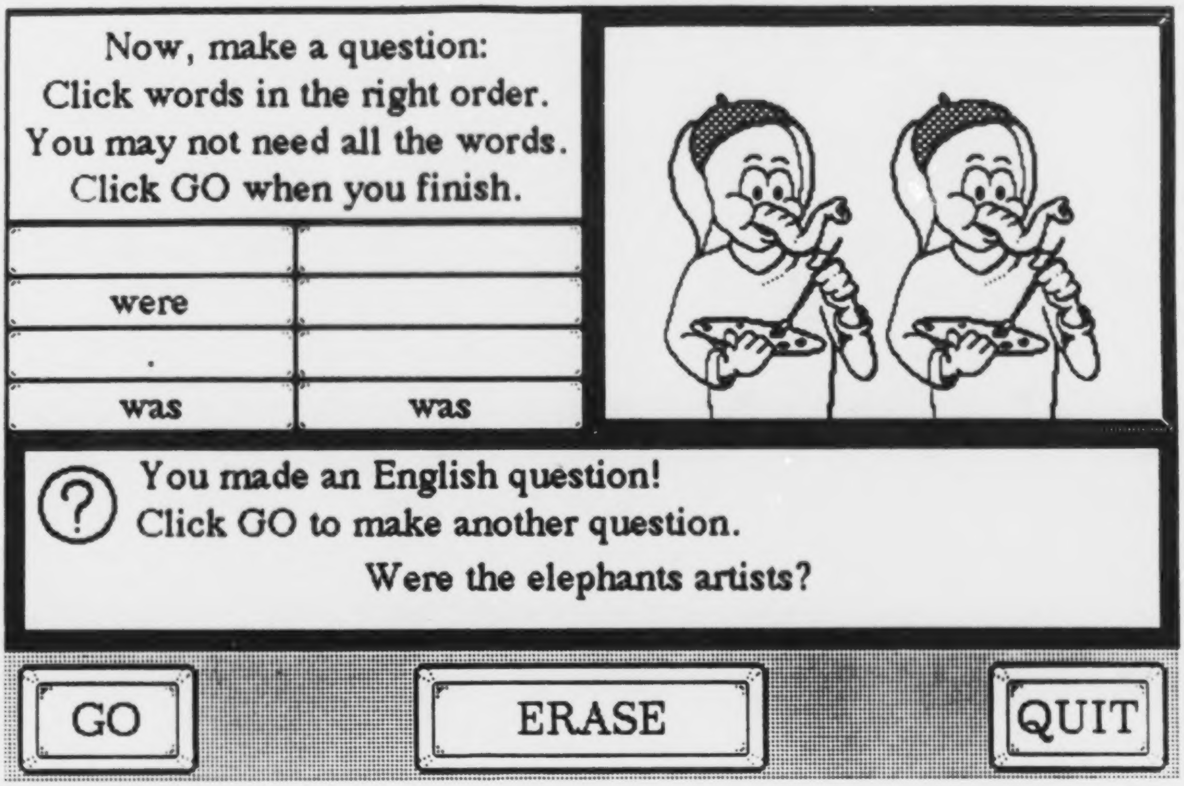
Were the elephants artists



Now, make a question:
Click words in the right order.
You may not need all the words.
Click GO when you finish.

were	
.	
was	was

Were the elephants artists?

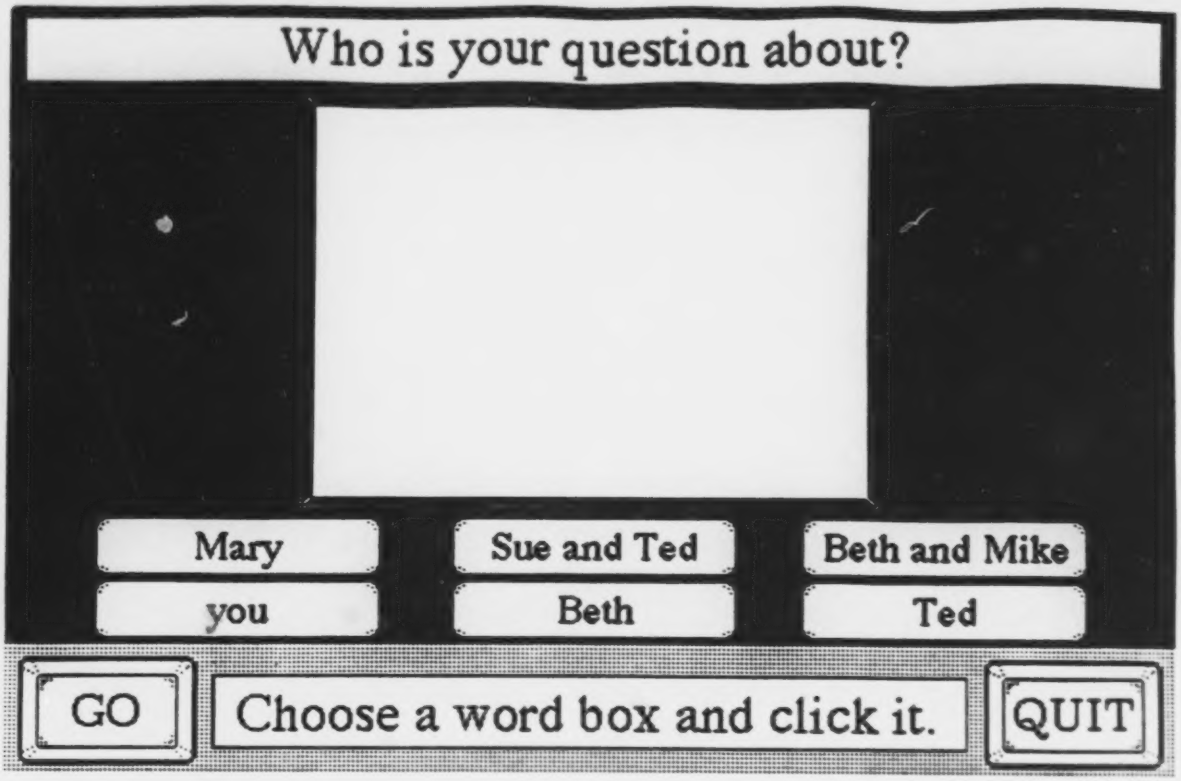


Now, make a question:
Click words in the right order.
You may not need all the words.
Click GO when you finish.

were	
.	
was	was

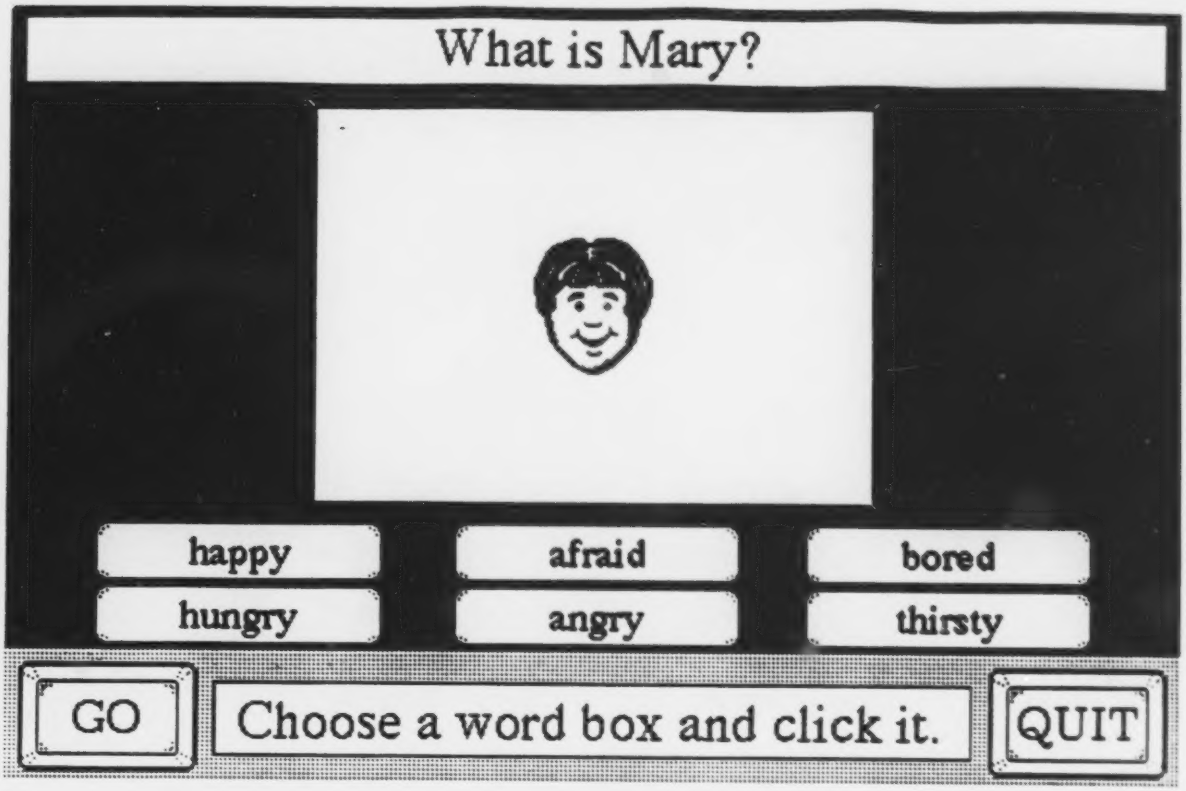
You made an English question!
Click GO to make another question.

Were the elephants artists?


Who is your question about?

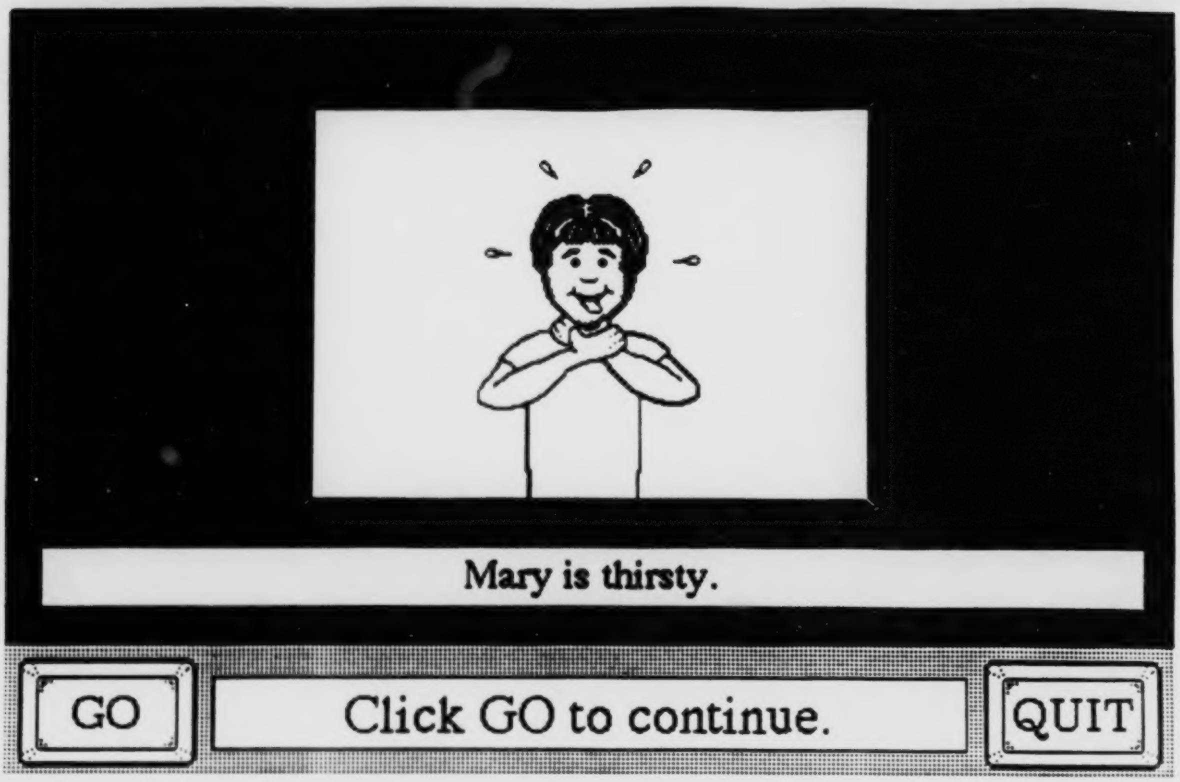
Choose a word box and click it.

Mary
Sue and Ted
Beth and Mike
you
Beth
Ted
GO
QUIT


What is Mary?

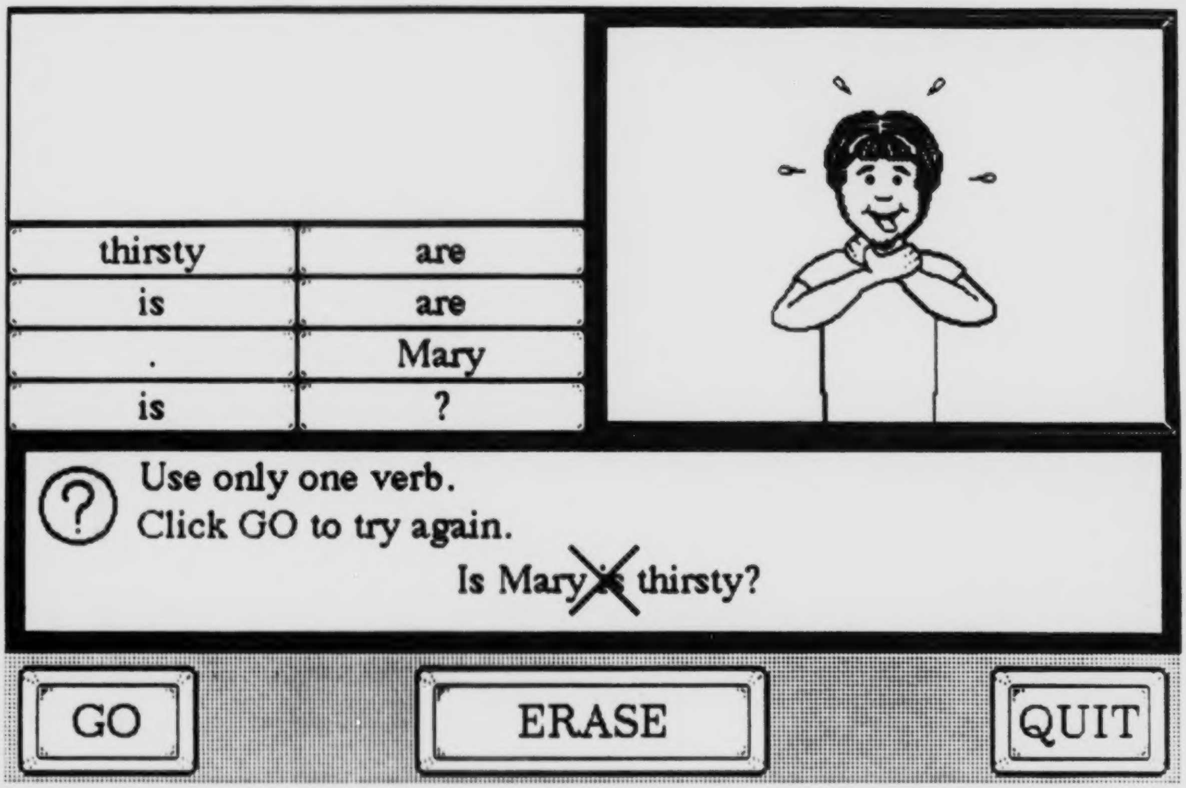
Choose a word box and click it.

happy
afraid
bored
hungry
angry
thirsty
GO
QUIT



Mary is thirsty.

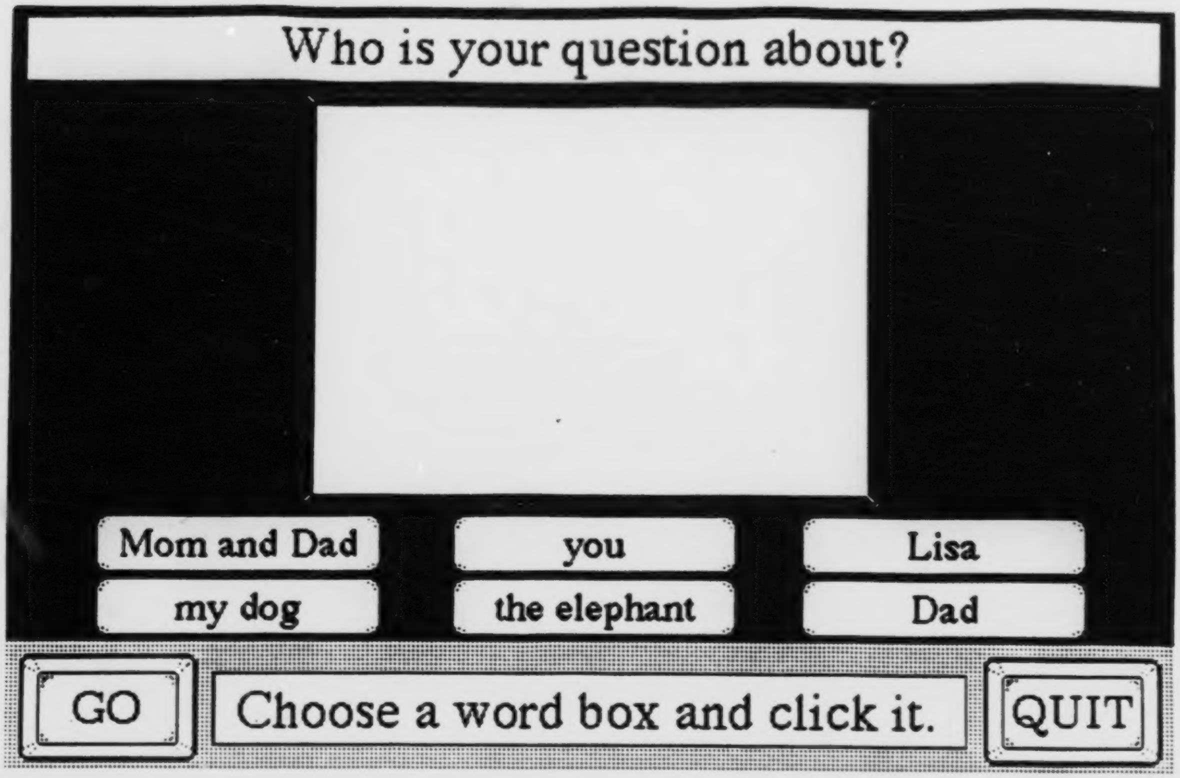
Click GO to continue.


GO
ERASE
QUIT

thirsty	are
is	are
.	Mary
is	?

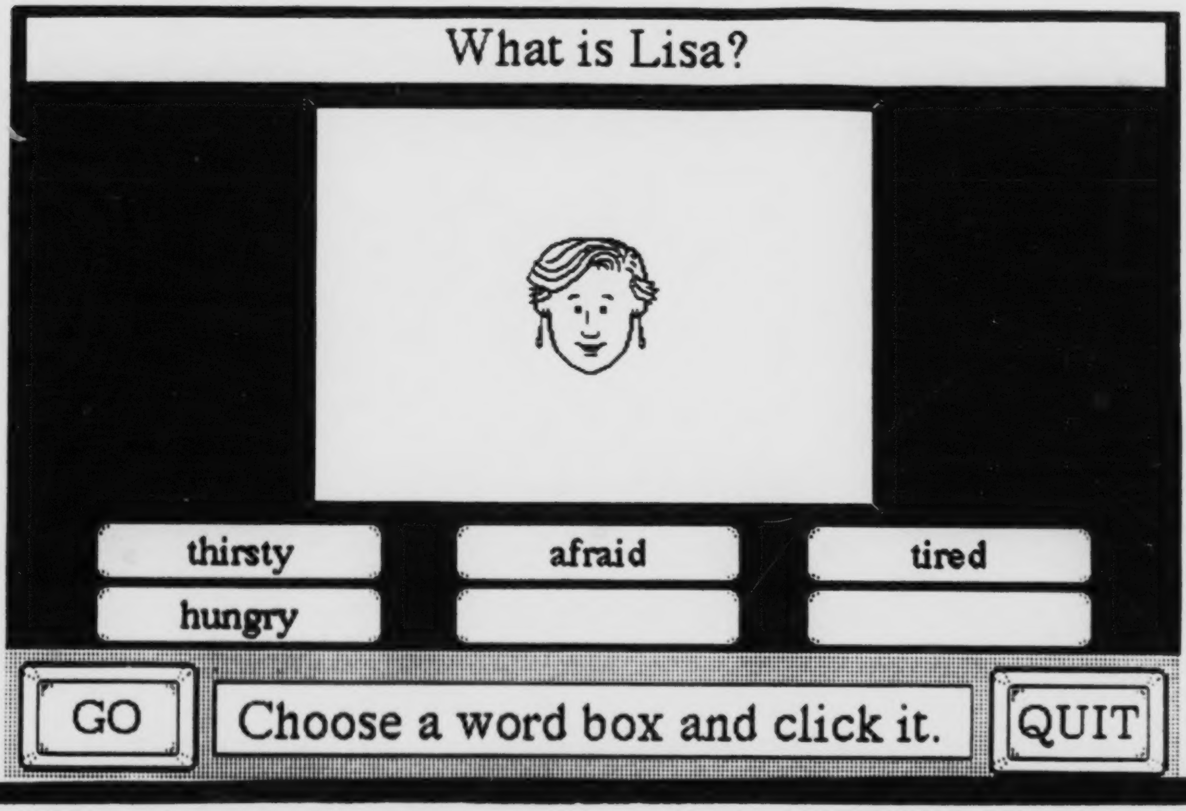
Use only one verb.
Click GO to try again.

Is Mary ~~is~~ thirsty?


Who is your question about?

Choose a word box and click it.

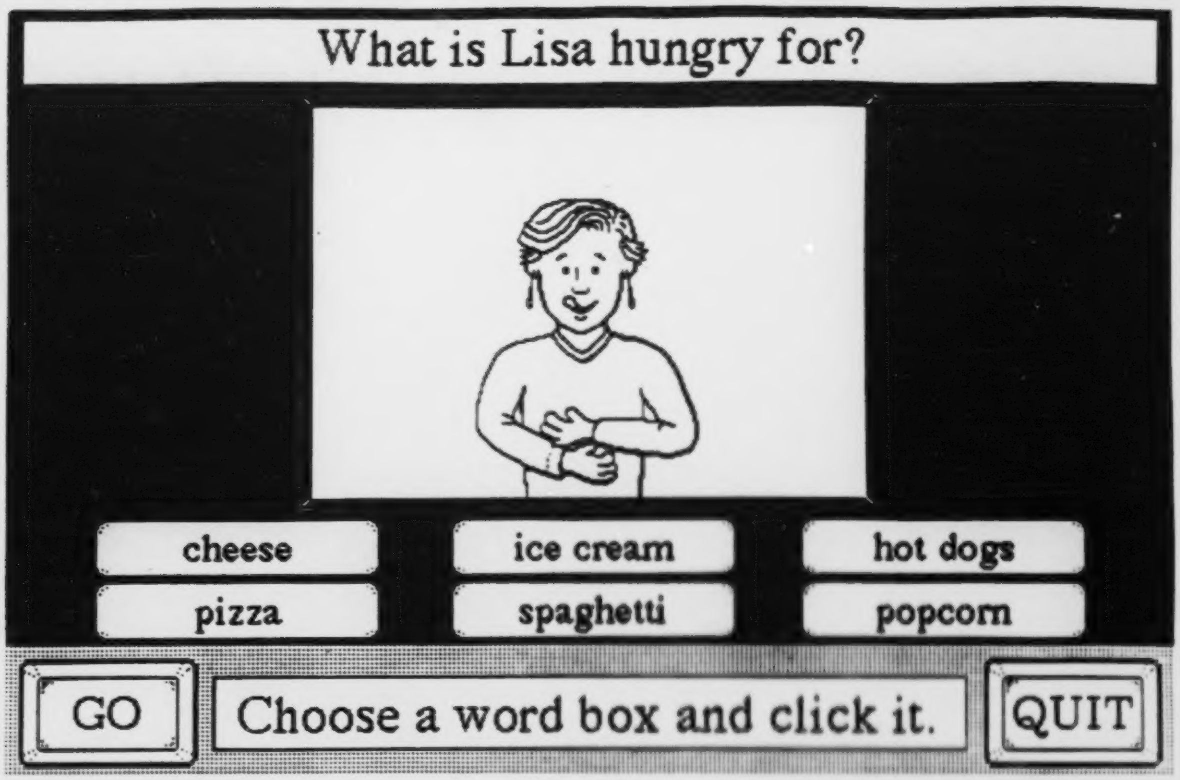
Mom and Dad
you
Lisa
my dog
the elephant
Dad
GO
QUIT


What is Lisa?

Choose a word box and click it.

thirsty
afraid
tired
hungry
GO
QUIT

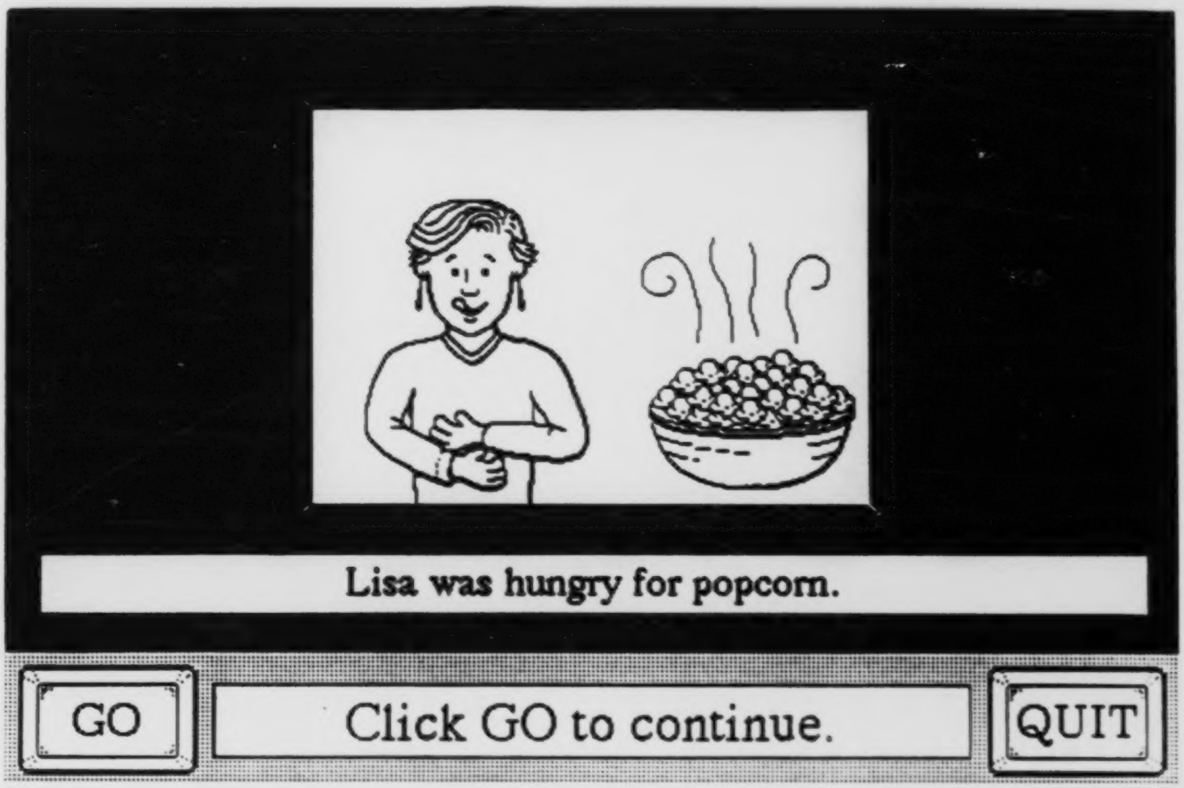
Note: Additional examples of sentences that learners can build are displayed on this and following pages.



What is Lisa hungry for?

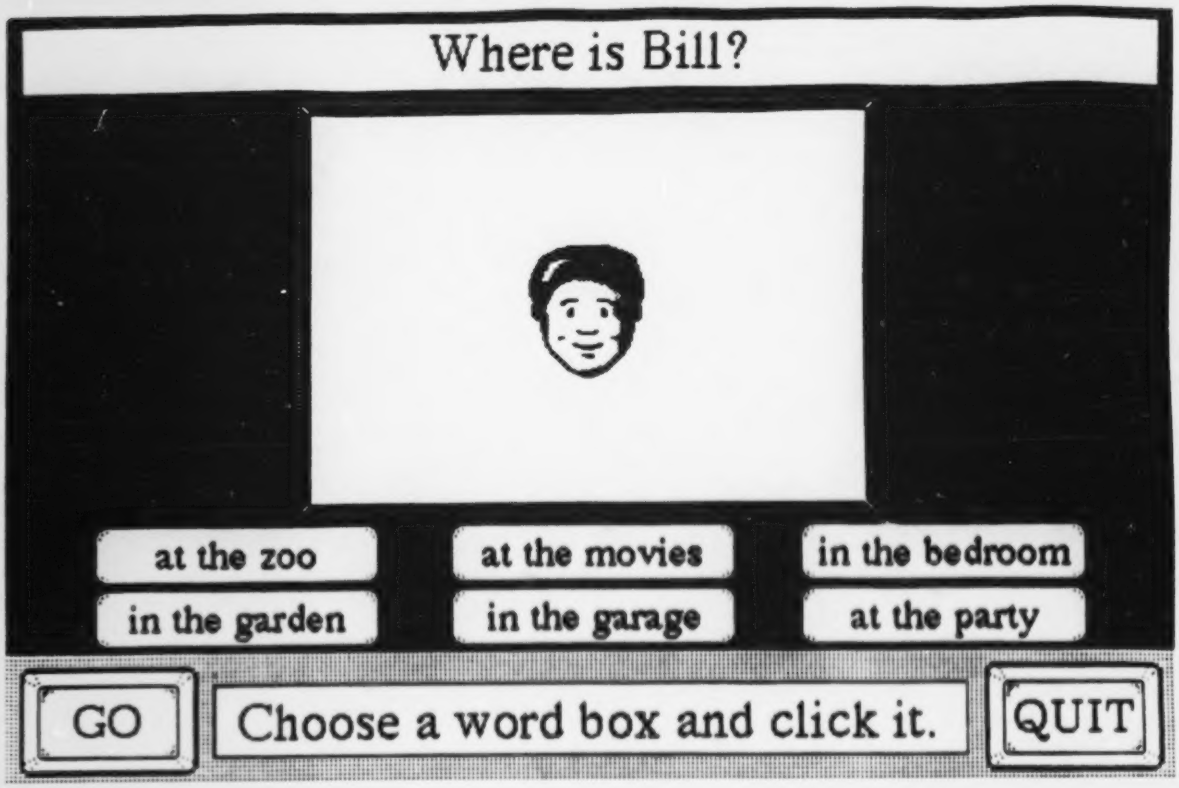
cheese
ice cream
hot dogs
pizza
spaghetti
popcorn
GO
QUIT

Choose a word box and click it.



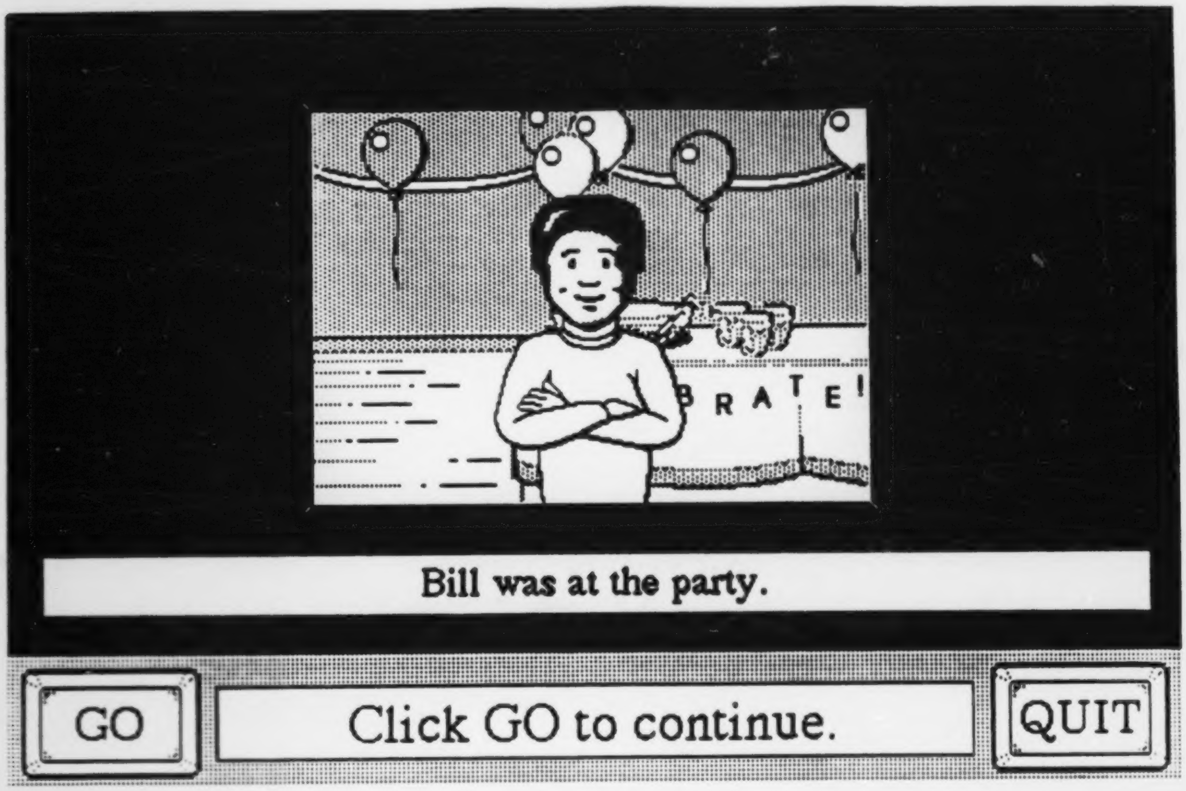
Lisa was hungry for popcorn.

Click GO to continue.


Where is Bill?

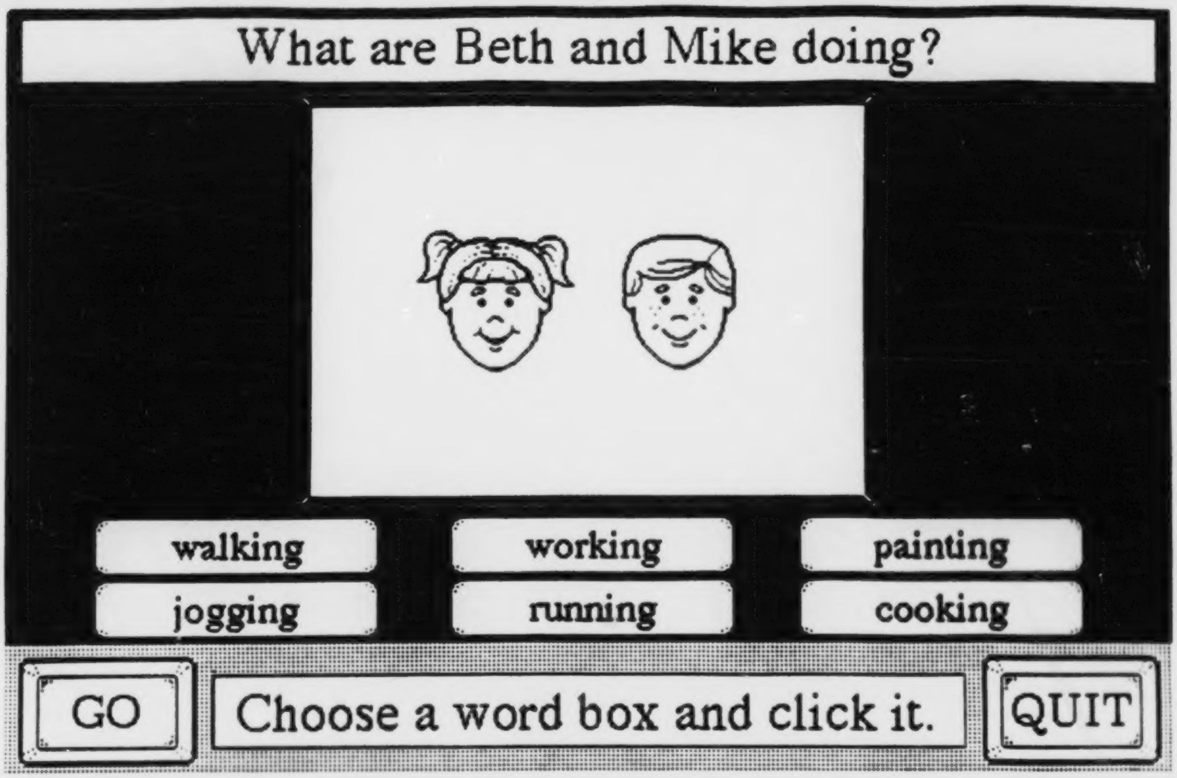
at the zoo
at the movies
in the bedroom
in the garden
in the garage
at the party
GO
QUIT

Choose a word box and click it.


BRATE!
GO
QUIT

Bill was at the party.

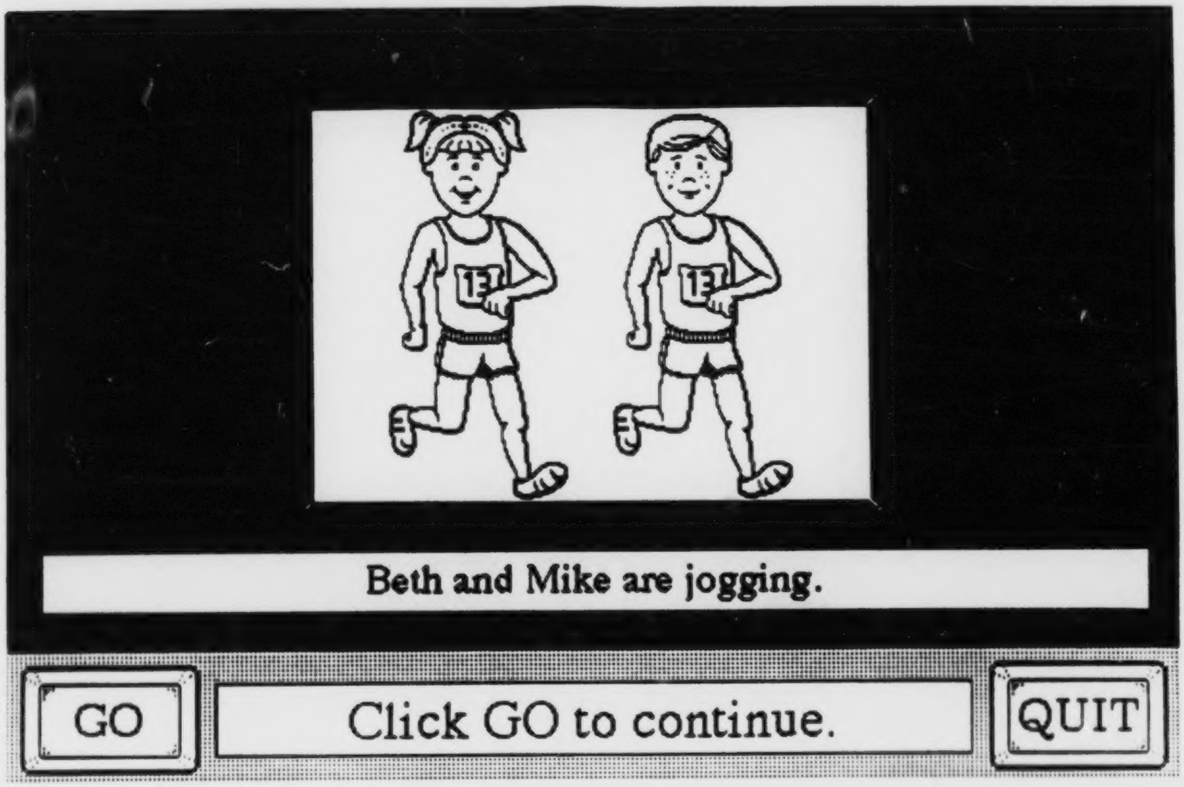
Click GO to continue.



What are Beth and Mike doing?

Choose a word box and click it.

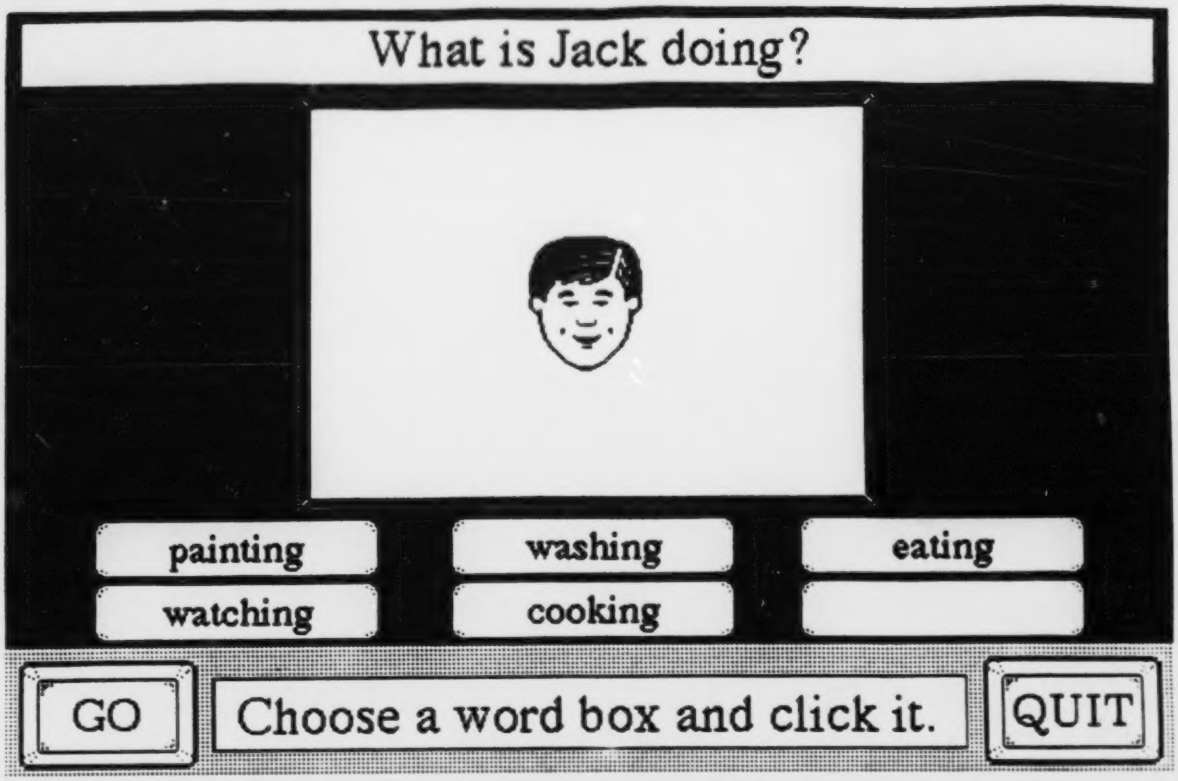
walking
working
painting
jogging
running
cooking
GO
QUIT



Beth and Mike are jogging.

Click GO to continue.

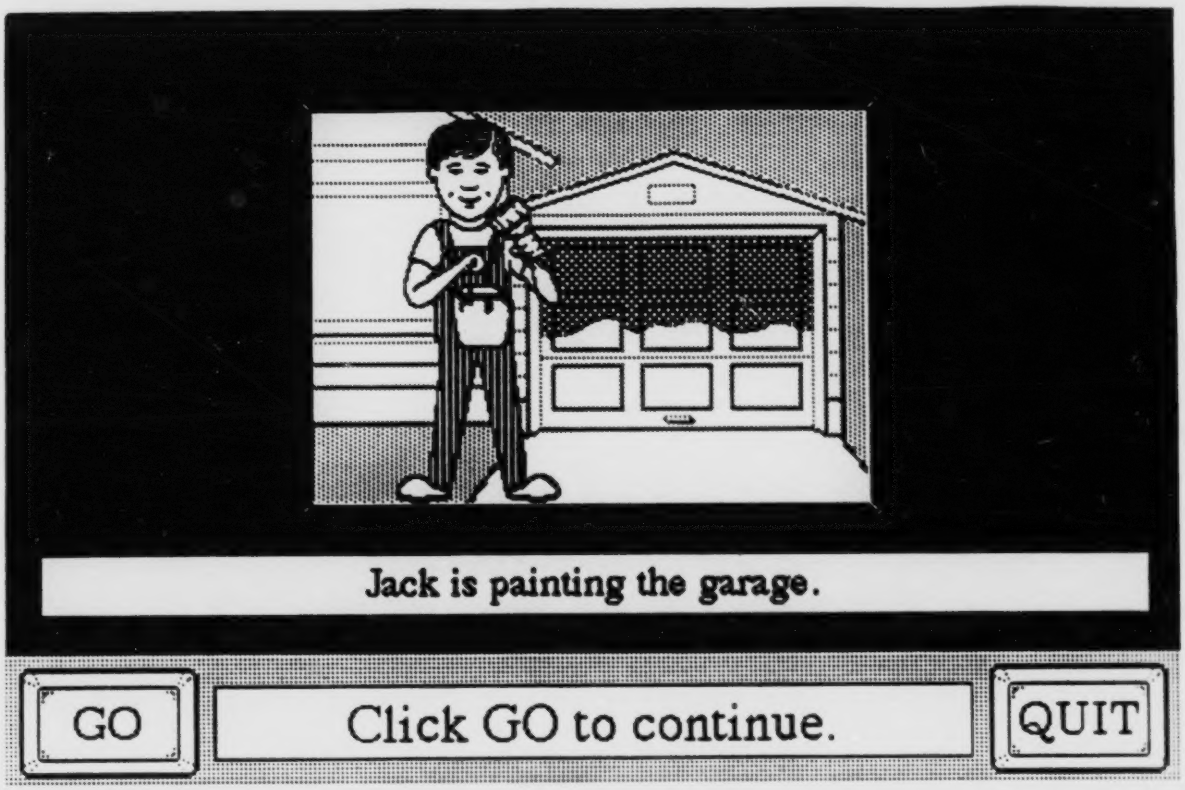
13
13
GO
QUIT



What is Jack doing?

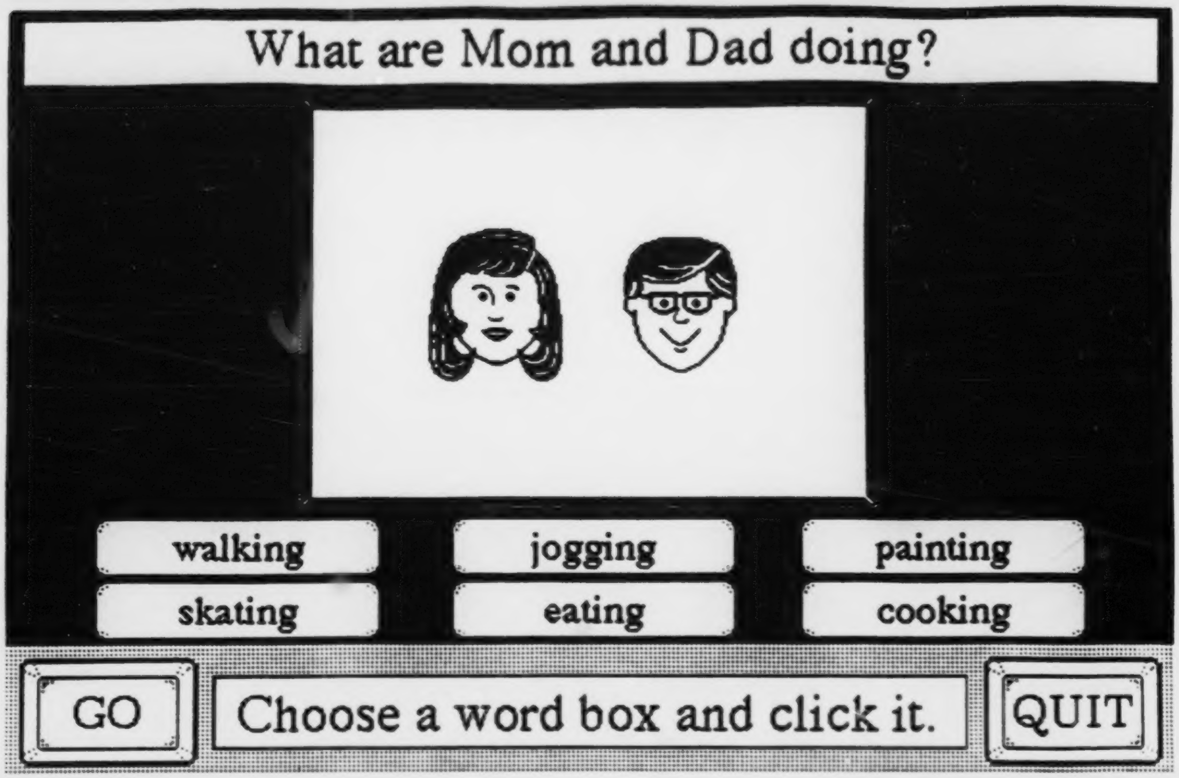
painting
washing
eating
watching
cooking
GO
QUIT

Choose a word box and click it.



Jack is painting the garage.

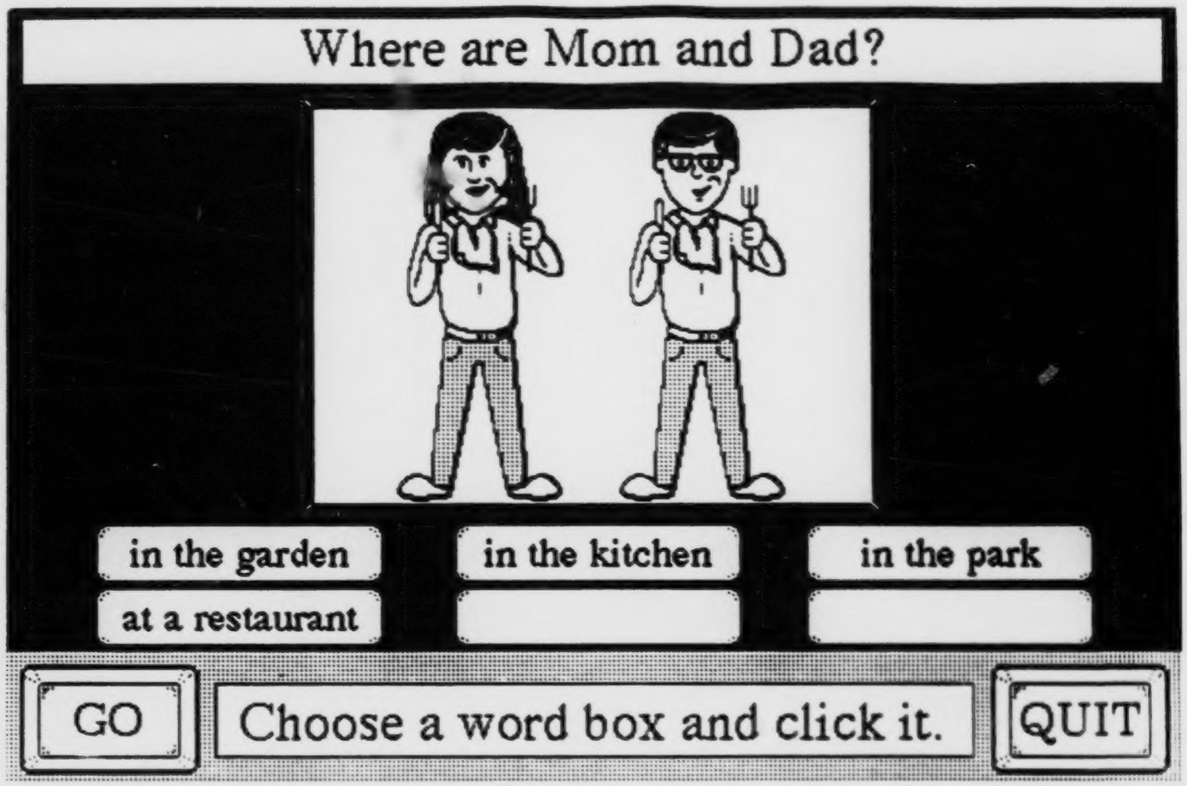
Click GO to continue.



What are Mom and Dad doing?

walking
jogging
painting
skating
eating
cooking
GO
QUIT

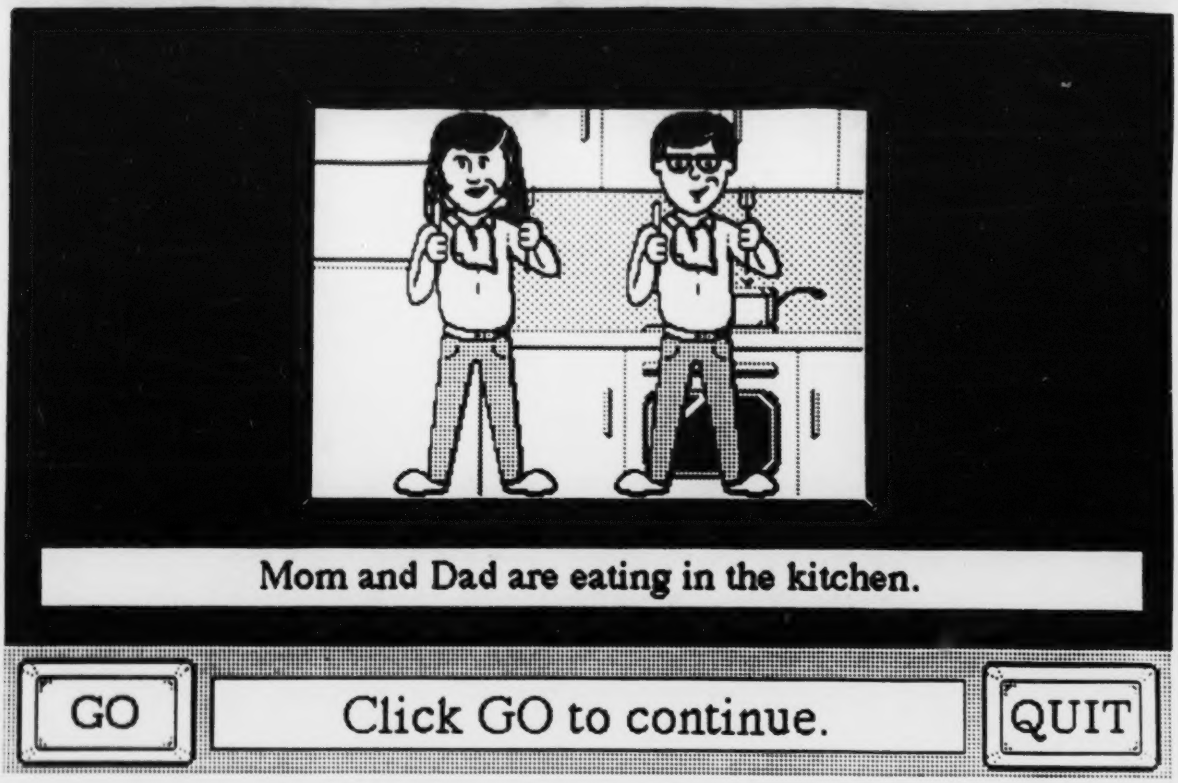
Choose a word box and click it.



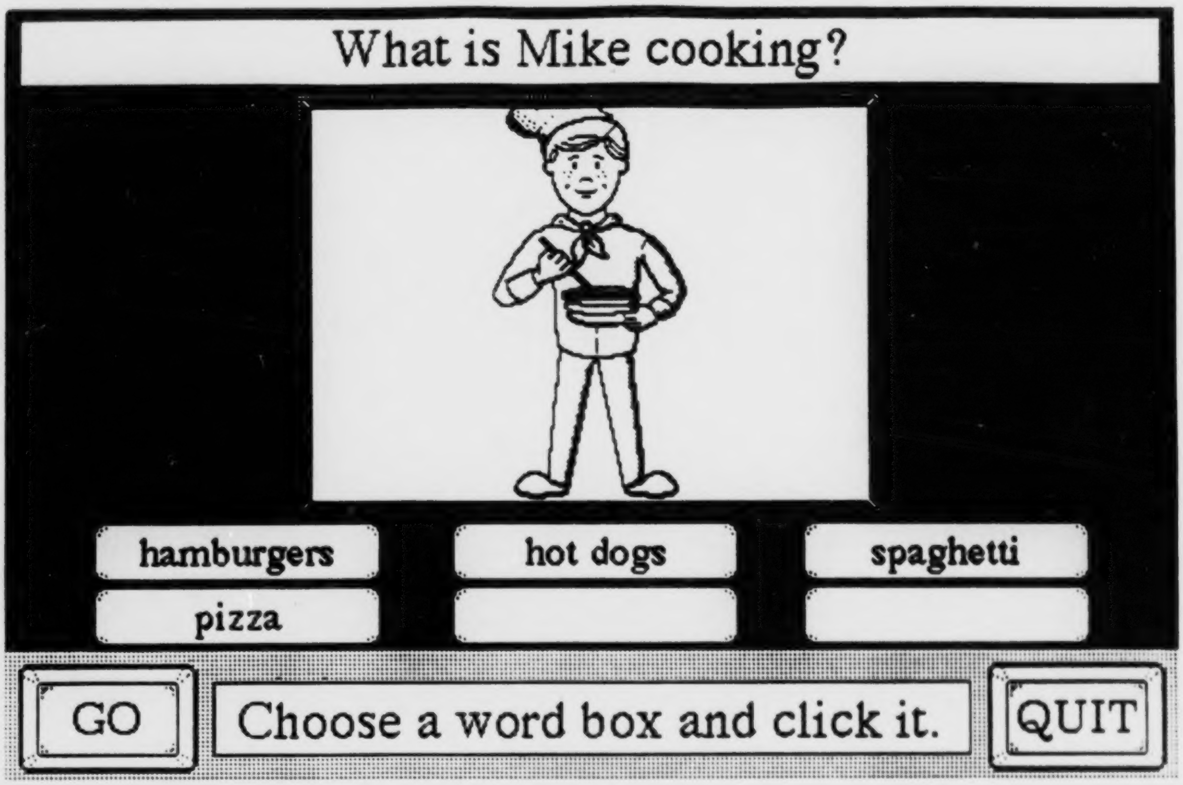
Where are Mom and Dad?

in the garden
in the kitchen
in the park
at a restaurant
GO
QUIT

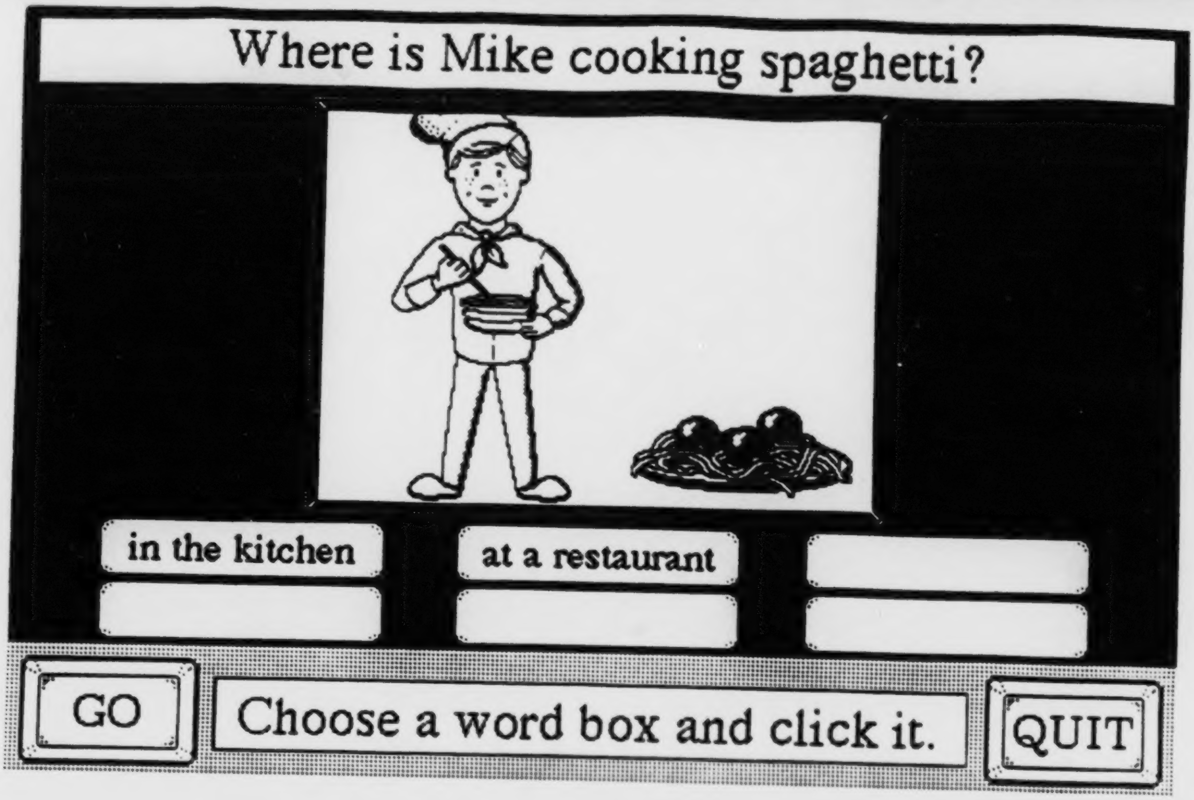
Choose a word box and click it.


Mom and Dad are eating in the kitchen.

Click GO to continue.


What is Mike cooking?

Choose a word box and click it.
hamburgers
hot dogs
spaghetti
pizza
GO
QUIT

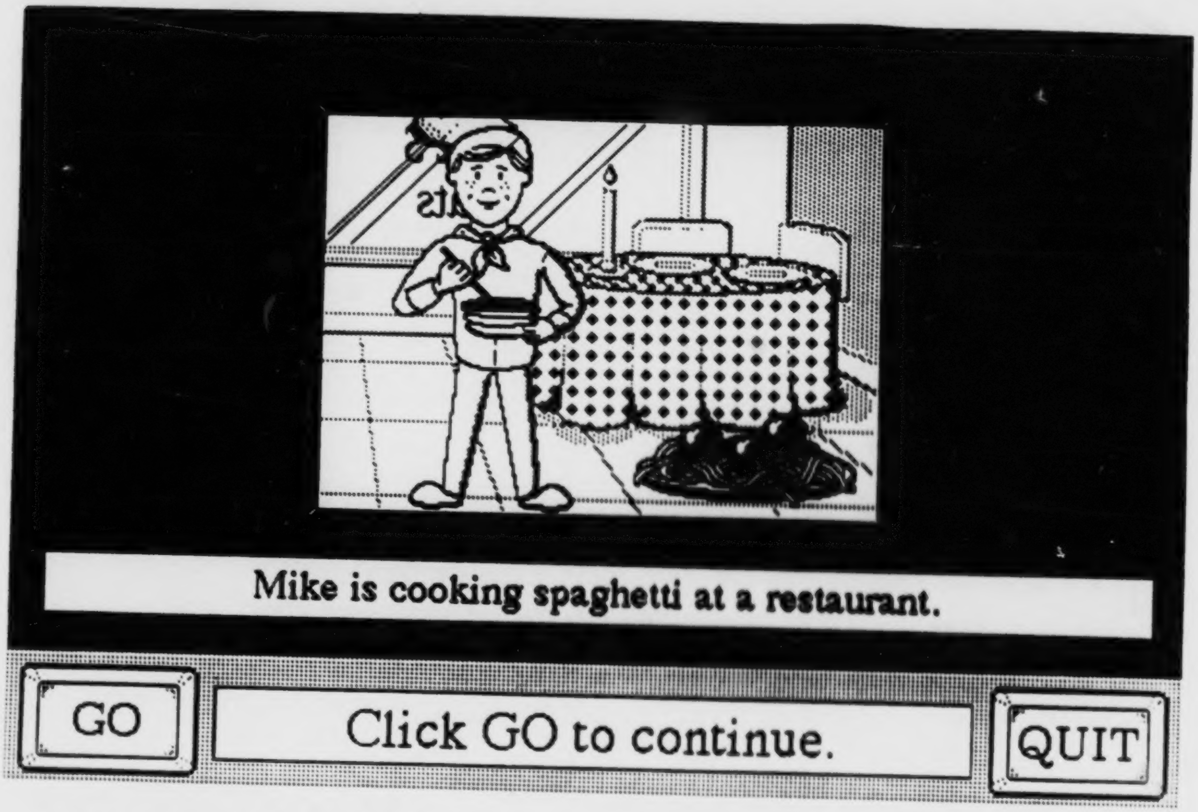


Where is Mike cooking spaghetti?

in the kitchen

at a restaurant

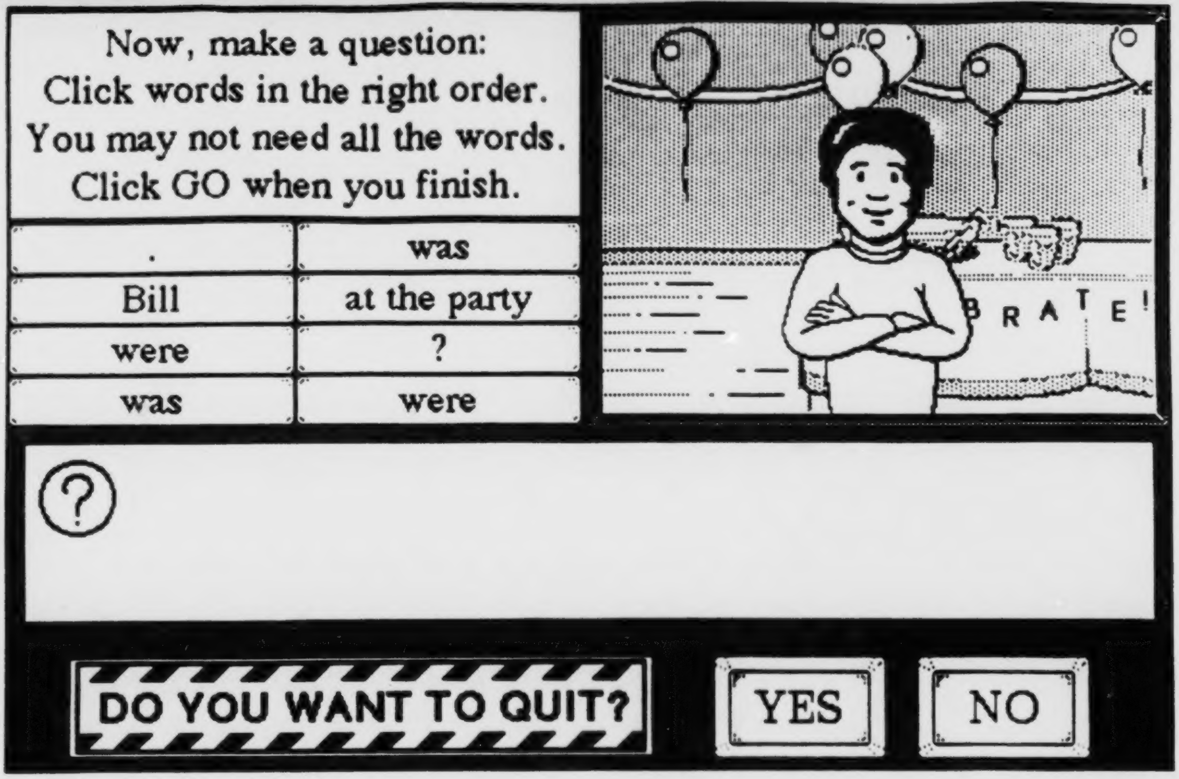
Choose a word box and click it.



Mike is cooking spaghetti at a restaurant.

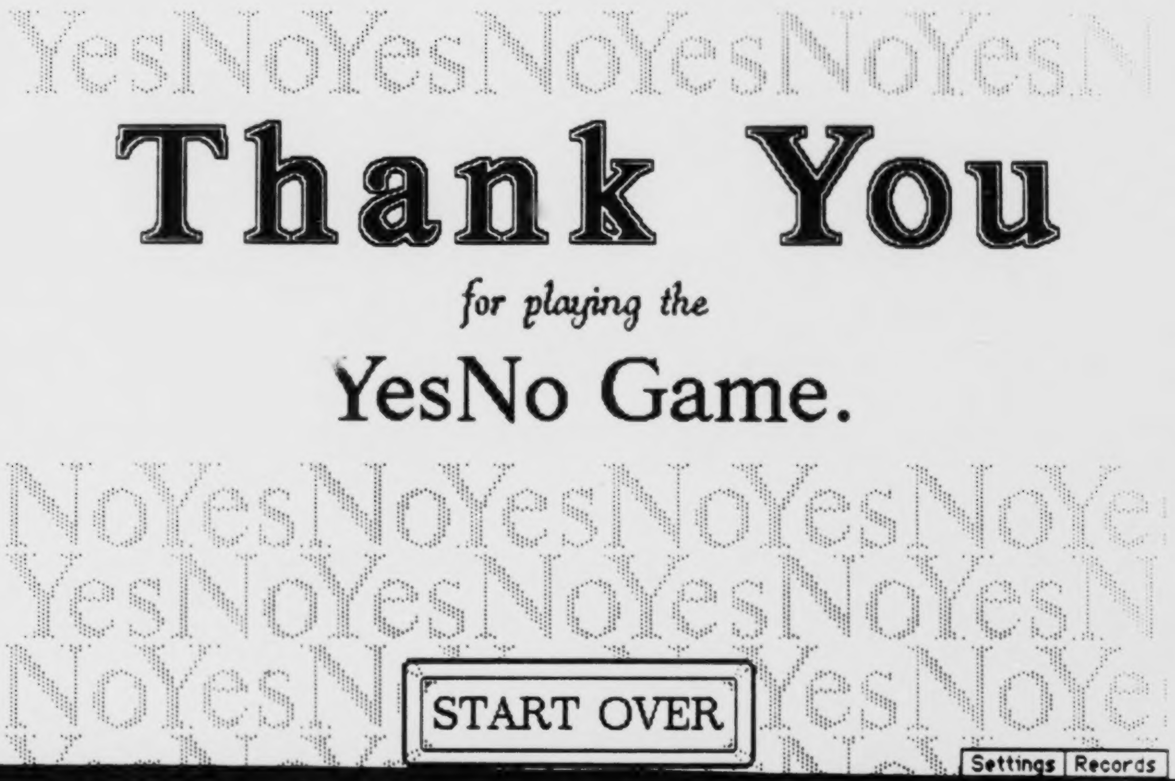
Click GO to continue.

BEST COPY AVAILABLE



Now, make a question:
Click words in the right order.
You may not need all the words.
Click GO when you finish.

.
was
Bill
at the party
were
?
was
were
BRATE!
?
DO YOU WANT TO QUIT?
YES
NO



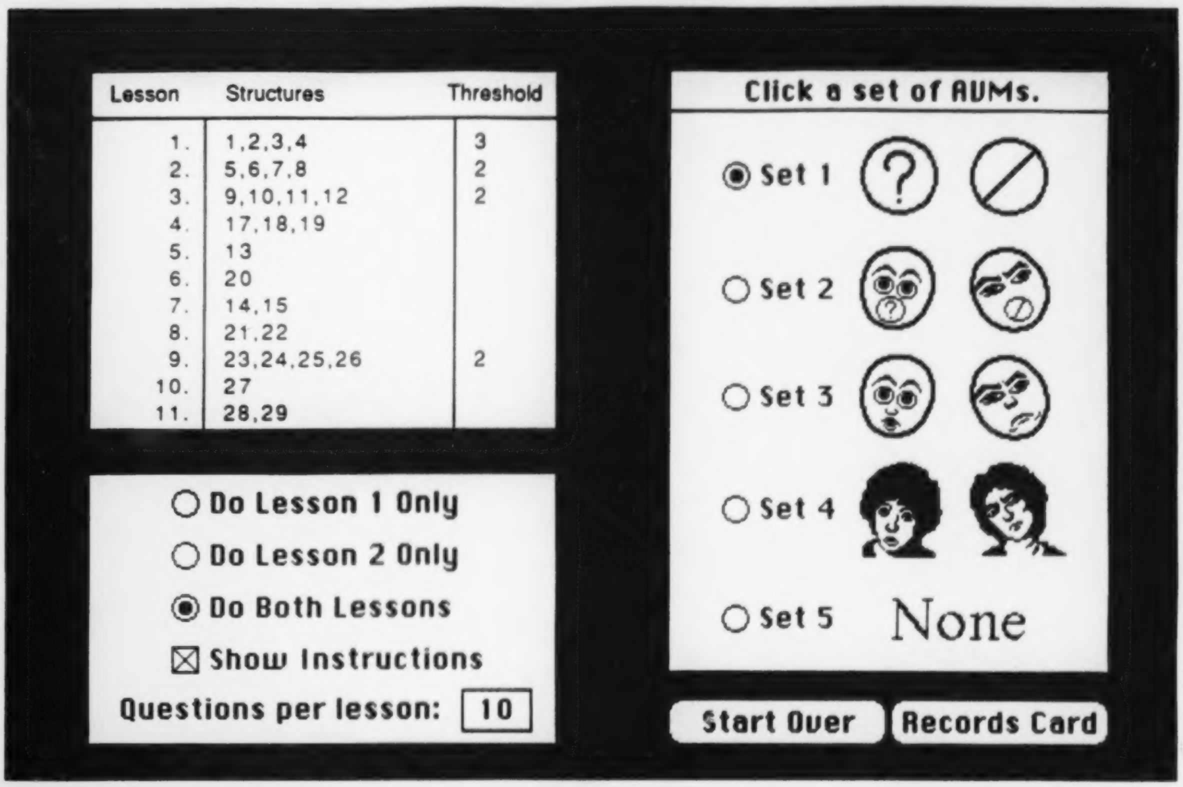
Thank You

for playing the

YesNo Game.

START OVER
Settings
Records

Note: Learners can quit at any time, though few elect to stop before their study period is over. When they click QUIT, they first see a screen which allows them to confirm or change their decision. If they decide to stop, they see a "thank you" screen which provides positive reinforcement.



Lesson	Structures	Threshold
1.	1,2,3,4	3
2.	5,6,7,8	2
3.	9,10,11,12	2
4.	17,18,19	
5.	13	
6.	20	
7.	14,15	
8.	21,22	
9.	23,24,25,26	2
10.	27	
11.	28,29	

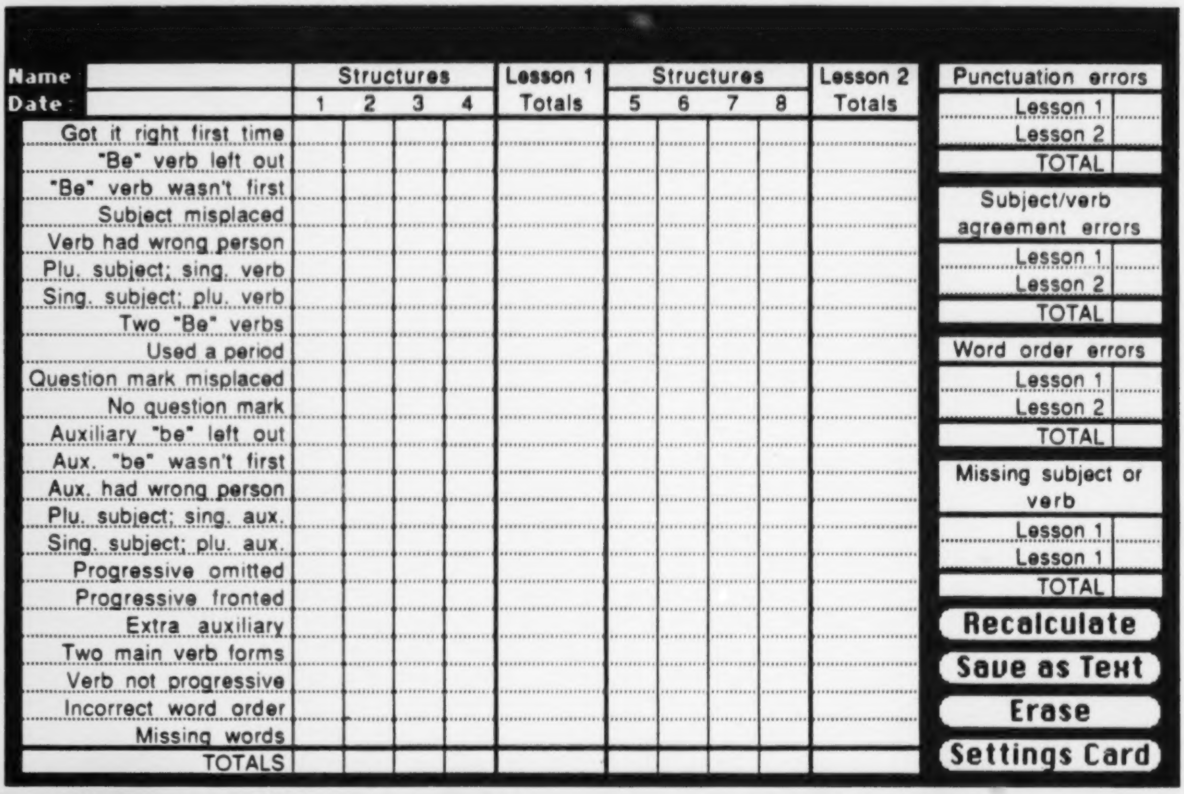
○ Do Lesson 1 Only

○ Do Lesson 2 Only

● Do Both Lessons

☒ Show Instructions

Questions per lesson: 10



Name

Date

	Structures 1	2	3	4	Lesson 1 Totals	Structures 5	6	7	8	Lesson 2 Totals
Got it right first time										
"Be" verb left out										
"Be" verb wasn't first										
Subject misplaced										
Verb had wrong person										
Plu. subject; sing. verb										
Sing. subject; plu. verb										
Two "Be" verbs										
Used a period										
Question mark misplaced										
No question mark										
Auxiliary "be" left out										
Aux. "be" wasn't first										
Aux. had wrong person										
Plu. subject; sing. aux.										
Sing. subject; plu. aux.										
Progressive omitted										
Progressive fronted										
Extra auxiliary										
Two main verb forms										
Verb not progressive										
Incorrect word order										
Missing words										
TOTALS										

Punctuation errors	
Lesson 1	
Lesson 2	
TOTAL	
Subject/verb agreement errors	
Lesson 1	
Lesson 2	
TOTAL	
Word order errors	
Lesson 1	
Lesson 2	
TOTAL	
Missing subject or verb	
Lesson 1	
Lesson 1	
TOTAL	

Note: Point and click menus in the Yes-No Game permit teachers to select specific lessons for each learner, and to vary the icons which symbolize negative and interrogative structures. Detailed records of all structures and errors are maintained for each learner.

The Structure of a Lesson in *The Yes-No I Game*

The educational content of the YesNo Game is partitioned into lessons. Each lesson presents sentences with related grammatical structures. A lesson nominally consists of a fixed number of sentences, however it is possible to leave a lesson early under certain conditions. The purpose of this document is to describe the structure of a lesson and the conditions under which a user of the YesNo Game is advanced from one lesson to the next, or to the end of the game.

Sentence Structures

Each lesson encompasses several sentence structures, each of which is assigned a number. Sentence structure 1, for example, is a subject followed by a form of the verb "be" followed by a predicate nominative. Structure 2 is the same, except that the predicate nominative is replaced by a predicate adjective, and so on. The sentence structures that are known to the YesNo Game are found on the cards called "structures 1" and "structures 2" in the YesNo stack.

Each lesson is assigned a list of sentence structures (to see which structures are assigned to which lessons, look at the "Settings" card in the YesNo stack (this is the card which appears when the stack launches)). As a user proceeds through a lesson, the program steps through the structure list in order, presenting one sentence from each structure. When the program gets to the end of the list, it wraps back to a specified point and starts over from there. This point is determined by the entries under the heading "Threshold" on the "Settings" card. Each entry is an index into the corresponding structure list. In lesson 1, for example, the order of sentence structures is as follows: 1,2,3,4,3,4,3,4,3,4, ...

Before the user can be advanced to a new lesson, s/he must have seen at least one sentence from each structure assigned to the current lesson.

Promotion

A user is promoted to the next lesson (or to the end of the game) when s/he has seen the prescribed number of sentences (currently ten), or if s/he gets three consecutive sentences right on the first try, subject to the restriction that the user must see at least one sentence from each structure assigned to the lesson.

Remediation

If the user has seen six sentences and has not yet been promoted, s/he is presumed to require remediation. The user is then taken to an example card and shown two examples. The first example is the sentence the user was just working with. The second example is a randomly selected sentence having the same structure as the first one.

Remediation is postponed as long as the user continues to get sentences right on the first try. If, for example, the user gets five sentences wrong but then gets the sixth one right on the first try, s/he will not be remediated. Remediation will occur the next time s/he gets a sentence wrong.

Flunking out

The user is given five chances to correctly transform each sentence. When the user doesn't get it after five chances, the program terms it to be a "failure." (The user, of course, isn't aware of this.) After four consecutive failures in a single lesson, or after six failures altogether in one lesson, the program gives up on the user, and s/he is sent to the end of the game.

Note that failures are difficult to come by, since after the user's second mistake, the program will correct the user's sentence if it can and advance the user to the next sentence. So for a failure to occur, the user must give five responses that are far enough off that the program can't to correct them.

Error Reporting in *The YesNo I Game*

The YesNo Game records errors made by users, categorizes them, and presents them in tabular form. These tables are automatically saved as text files which can be incorporated into a spreadsheet using a program such as Excel.

As the user interacts with the program, his/her errors are recorded in a table on the card called "Records". (The period appears outside of the quotes to make it clear that the period is not part of the name of the card. That's why I hate that rule.) To view this card, press the "Records Card" button that's on the "Settings" card (The "Settings" card is the first card you see when you run the stack). Alternately, type 'go card "Records"' into the message box.

The Records card contains the error totals for the most recent user. If nobody has used the stack since it was last opened, then the Records card will be blank. There are buttons on the card to recalculate the row and column totals, to erase the tables, and to save the tables to a text file. Normally, you won't need to use these buttons, since the stack automatically saves records files as each user finishes.

When a user completes the YesNo game, or when s/he quits via the QUIT button, the tables of error totals is automatically saved to a text file with the name "Records nn/nn/nn", where nn/nn/nn is the current date. If the program chooses a file name which is already being used, then the program appends "x"s to the file name until it gets a file name which is not being used. For example, if the program wants to save a file called "Records 01/01/99", but there is already a file with that name (left over from a previous session, perhaps), then the program will use the name "Records 01/01/99x" instead.

The records file is saved when the user gets to the Thank You card. If the user never gets to the Thank You card, then the records are not saved. In this case, you can go to the Thank You card yourself, thus triggering the saving of the records, or you can go to the Records card and save the records file from there, using the "Save as Text" button.

The records file is saved as a standard text file, which can be read by any word processor or text editor. For some reason, importing the records file directly into Excel doesn't work; the formatting gets messed up. This may be a problem with the version of Excel I have. The work-around is to open a records file from a word processor, select the entire document, and copy it to the clipboard. Then open Excel and paste. Now the formatting will be correct.

What the Numbers Mean

The YesNo game records 22 different kinds of errors. Some types of errors are specific to certain types of sentences. The errors are checked in a fixed order, and only the first error detected is reported. Here is a list of the errors that are recognized and the order in which they are checked.

Lesson 1

In lesson 1, all of the sentences used the verb "be" as their main verb. The errors are checked as follows:

Used a period. The error-correction mechanisms are thrown off by strings with periods floating around in the middle of them, so the program wants to get rid of them first. If the user places a period anywhere in the string except at the end, the "Used a period" error is generated before any further error checking is done.

Question mark misplaced. The error-correction mechanisms are likewise thrown off by strings with question marks in positions other than at the end of the question. If the user places a question mark in the middle of the sentence, the "Question mark misplaced" error is generated.

"Be" verb left out. Generated if the user does not include any form of the verb "be" in the sentence.

Missing words. If any of the other words were left out, this error is generated.

Two "be" verbs. Generated if more than one form of the "be" verb was used.

Verb had wrong person. Generated if the person of the verb doesn't match the person of the subject. The current version of the YesNo game does not allow users to make this error.

Plu. subject; sing. verb. Generated if the user chose a singular verb for a plural subject.

Sing. subject; plu. verb. Generated if the user chose a plural verb for a singular subject.

"Be" verb wasn't first. Generated if any form of the "be" verb was used, but was not placed at the beginning of the sentence.

Subject misplaced. This error is generated if the subject is included but not placed immediately after the verb.

No question mark. Generated if there's no question mark at the end of the sentence.

Used a period. Finally, the program checks for a period at the end of the sentence. If the user ended his/her sentence with a period, then the same error is generated as if s/he had put a period in the middle of the sentence.

Lesson 2

In lesson 2, all sentences contain the verb "be" as an auxiliary, followed by a verb in the progressive. The errors are checked as follows:

Used a period. The error-correction mechanisms are thrown off by strings with periods floating around in the middle of them, so the program wants to get rid of them first. If the user places a period anywhere in the string except at the end, the "Used a period" error is generated before any further error checking is done.

Question mark misplaced. The error-correction mechanisms are likewise thrown off by strings with question marks in positions other than at the end of the question. If the user places a question mark in the middle of the sentence, the "Question mark misplaced" error is generated.

Auxiliary "be" left out. Generated if the user does not include any form of the verb "be" in the sentence.

Progressive omitted. Generated if no form of the main verb was chosen by the user.

Missing words. If any of the other words were left out, this error is generated.

Extra auxiliary. Generated if more than one form of the auxiliary was used.

Two main verb forms. Generated if the user chooses more than one form of the main verb.

Aux. had wrong person. Generated if the person of the auxiliary doesn't match the person of the subject.

Plu. subject; sing. aux. Generated if the user chose a singular auxiliary for a plural subject.

Sing. subject; plu. aux. Generated if the user chose a plural auxiliary for a singular subject.

Aux. "be" wasn't first. Generated if any form of the "be" verb was used, but was not placed at the beginning of the sentence.

Progressive fronted. Generated if the user put a form of the main verb (progressive or not) immediately after the auxiliary. We know that the auxiliary is at the front of the sentence, since that check comes before this one.

Verb not progressive. Generated if the user chooses a form of the main verb which is not in the progressive.

Subject misplaced. This error is generated if the subject is included but not placed immediately after the auxiliary.

No question mark. Generated if there's no question mark at the end of the sentence.

Used a period. Finally, the program checks for a period at the end of the sentence. If the user ended his/her sentence with a period, then the same error is generated as if s/he had put a period in the middle of the sentence.

Structure and Promotion in *Yes-No II Lessons*

Lesson 1. Questions with *does*

Example Sentences

All example sentences involve *does*. One example from structure B and two examples from structure D are shown.

Question Choices

In the first four questions:
  Two questions from structure B.
  Two questions from structure D.
In following questions:
  Randomly distributed between structures B and D.
  If they are doing more poorly on one question type than another, that question type is chosen with a 75% frequency.

Another question

If none the following criteria are met, then the student is given another question.

Promotion

The student is promoted to Lesson 2 when they answer three questions in a row correctly on the first try.

Promotion from remediation

If the student has been remediated to Lesson 1 from some other lesson, the student is promoted back to that lesson when they answer three questions in a row correctly on the first try.

Graduation

Graduation is not possible from Lesson 1.

Remediation

Remediation can not happen if the student is currently in a remediation or has previously been relocated. If those conditions are not met, then the student is remediated if:

- the last four questions have been answered incorrectly, or
- the student has attempted six questions without being promoted, unless the student answered the most recent question correctly. This prevents remediation after success.

Notice that, as a result of the last rule, the first time a student answers a question incorrectly after the sixth question, s/he will be remediated immediately.

Remediation from Lesson 1 simply involves seeing the introductory material again.

Relocation

Relocation can not happen if the student has previously been relocated. If s/he has not, then relocation occurs if:

- the student has answered twelve questions without promotion, or
- the student has previously been remediated from Lesson 1 and has answeredthe last four questions incorrectly, or
- the student is currently in remediation and qualifies for another remediation.

The student will always be relocated to Lesson 2.

Removal

The student is removed if they have previously been relocated and now qualify for remediation.

Lesson 2. Questions with *do*

Example Sentences

All example sentences involve *do*. One example from structure B and two examples from structure D are shown.

Question Choices

In the first four questions:
- Two questions from structure B.
- Two questions from structure D.

In following questions:
- Randomly distributed between structures B and D.
- If they are doing more poorly on one question type than another, that question type is chosen with a 75% frequency.

Another question

If none the following criteria are met, then the student is given another question.

Promotion

The student is promoted to Lesson 3 (the First Review) when they answer three questions in a row correctly on the first try.

Promotion from remediation

If the student has been remediated to Lesson 2 from some other lesson, the student is promoted back to that lesson when they answer three questions in a row correctly on the first try.

Graduation

Graduation is not possible from Lesson 2.

Remediation

Remediation from Lesson 2 occurs in response to the same situations as remediation from Lesson 1.

Remediation from Lesson 2 involves seeing the Lesson 2 introductory material again.

Relocation

Relocation occurs in response to the same situations as relocation from Lesson 1.

The student will always be relocated to Lesson 3.

Removal

The student is removed if they have previously been relocated and now qualify for remediation.

Lesson 3. The first practice: Questions with *do* and *does*.

Example Sentences

There are no example sentences for the practice screens.

Question Choices

In the first six questions:
  Two questions from structure B with *does*.
  Two questions from structure B with *do*.
  One question from structure D with *does*.
  One question from structure D with *do*.
In following questions:
  The program will give them question types in this order: DoesB, DoesD, DoB, DoD, until they get one of each type right.

Another question

If none the following criteria are met, then the student is given another question.

Promotion

The student is promoted to Lesson 4 when they answer one of each type correctly.

Promotion from remediation

If the student has been remediated to Lesson 4 from some other lesson, the student is promoted back to that lesson when they answer one of each type correctly.

Graduation

Graduation is not possible from Lesson 2.

Remediation

Remediation can not happen if the student is currently in a remediation or has previously been relocated. If those conditions are not met, then the student is remediated if:

- six questions have been asked, and
- all three questions with one helping verb (does or do) were not answered correctly

or

- more that six questions have been asked, and
- the last four questions were answered incorrectly

or

- more than nine questions have been asked, and
- the last question was answered incorrectly

Students remediated from Lesson 4 will be placed in Lesson 1 or Lesson 2, depending on their area of greatest need.

Relocation

Relocation can not happen if the student has previously been relocated. If s/he has not, then relocation occurs if:

- the student has answered twelve questions without promotion, or
- the student has previously been remediated from Lesson 1 and has answeredthe last four questions incorrectly, or
- the student is currently in remediation and qualifies for another remediation.

The student will always be relocated to Lesson 5.

Removal

The student is removed if they have previously been relocated and now qualify for remediation.

Lesson 4. Questions with *did*..

Example Sentences

All example sentences involve *did*. One example from structure B and two examples from structure D are shown.

Question Choices

In the first four questions:
    Two questions from structure B.
    Two questions from structure D.
In following questions:
    Randomly distributed between structures B and D.
    If they are doing more poorly on one question type than another, that question type is they get one of each type right.

Another question

If none the following criteria are met, then the student is given another question.

Promotion

The student is promoted to Lesson 5 (the Final Review) when they answer three questions in a row correctly on the first try.

Promotion from remediation

If the student has been remediated to Lesson 4 from some other lesson, the student is promoted back to that lesson when they answer three questions in a row correctly on the first try.

Graduation

Graduation is not possible from Lesson 4.

Remediation

Remediation from Lesson 4 occurs in response to the same situations as remediation from Lesson 1.

Remediation from Lesson 4 involves seeing the Lesson 4 introductory material again.

Relocation

Relocation occurs in response to the same situations as relocation from Lesson 1.

The student will always be relocated to Lesson 5.

Removal

The student is removed if they have previously been relocated and now qualify for remediation.

Lesson 5. The final practice: Questions with *do*, *does, and did.*

Example Sentences

There are no example sentences for the practice screens.

Question Choices

In the first six questions:
  One question from structure B with *does.*
  One question from structure B with *do.*
  One question from structure B with *did.*
  One question from structure D with *does.*
  One question from structure D with *do.*
  One question from structure D with *did.*
In following questions:

The program will give them question types in this order: DoesB, DoesD, DoB, DoD, DidB, DidD, until they get one of each type right.

Another question

If none the following criteria are met, then the student is given another question.

Promotion

The student cannot be promoted from Lesson 5—see Graduation.

Promotion from remediation

Since the student cannot be remediated to this lesson, that cannot be re-promoted.

Graduation

Graduation occurs when the student answers one of each of the six question types correctly.

Remediation

Remediation can not happen if the student is currently in a remediation or has previously been relocated. If those conditions are not met, then the student is remediated if:

- six questions have been asked, and
- both questions with one helping verb (does,do, or did) were not answered correctly

or

- more that six questions have been asked, and
- the last four questions were answered incorrectly

or

- more than nine questions have been asked, and
- the last question was answered incorrectly

Students remediated from Lesson 4 will be placed in Lesson 1, Lesson 2, or Lesson 4, depending on their area of greatest need.

Relocation

Students are not relocated from Lesson 5, since the point of relocation is to ensure that the student has some experience with each screen.

Removal

The student is removed if they have previously been relocated and now qualify for remediation.

Error Checking and Feedback in *Yes-No II*

Error 1. Used a period

Error explanation

The student put a period in the sentence anywhere but at the end.

Feedback

- Error message: A period does not belong in a question.
  X flashes over period.
  Try again.
- Error message: Do not put a period in a question.
  X flashes over period.
  Move on.

Error 2. Question mark misplaced

Error explanation

The student put a question mark anywhere but at the end of the question.

Feedback

- Error message: A question mark belongs at the end of a question.
  The misplaced question mark flashes and stays highlighted.
  An arrow points to the end of the sentence.
  Try again.
- Error message: A question mark belongs at the end of a question.
  The misplaced question mark flashes then dissolves.
  An arrow points to the end of the sentence.
  Move on.

Error 3. No helping verb

Error explanation

The student did not include any helping verb in the question.

Feedback

- Error message: Begin your question with a helping verb.
  The helping verbs in the answer buttons flash.
  An arrow points to the beginning of the sentence.
  Try again.
- Error message: Begin your question with the helping verb, "does."
  The correct helping verb answer button flashes.
  An arrow points to the beginning of the sentence.
  Try again.

- Error message: Here is the correct question.
  The correct question is displayed—animated if possible.
  Move on.

Error 4. No main verb

Error explanation

The student did not include a main verb in the question.

Feedback

- Error message: Put a main verb in your question.
  The main verbs in the answer buttons flash.
  If this is the only error, an arrow points to the correct location in the sentence.
  Try again.
- Error message: Use the main verb, "exemplify," in your question.
  The correct main verb button flashes and stays highlighted.
  If this is the only error, an arrow points to the correct location in the sentence.
  Try again.
- Error message: Here is the correct question.
  The correct question is displayed—animated if possible.
  Move on.

Error 5. Missing other sentence part

Error explanation

The student did not include a subject, direct object, adverbial of time, or adverbial of place.

Feedback

- Error message: Put "what is missing" in your question.
  The correct answer button flashes and stays highlighted.
  If this is the only error, an arrow points to the correct location in the sentence.
  Try again.
- Error message: Use "what is missing" in your question.
  The correct answer button flashes and stays highlighted.
  If this is the only error, an arrow points to the correct location in the sentence.
  Try again.
- Error message: Here is the correct question.
  The correct question is displayed—animated if possible.
  Move on.

Error 6. Two helping verbs

Error explanation

The student included two helping verbs in the question.

Feedback

- Error message: Use only one helping verb.
  The correct helping verbs button flashes and stays highlighted.
  An arrow points to the beginning of the sentence.
  Try again.
- Error message: Use a helping verb at the beginning of your sentence.
  The correct helping verbs button flashes and stays highlighted.
  An arrow points to the beginning of the sentence.
  Try again.
- Error message: Here is the correct question.
  The correct question is displayed—animated if possible.
  Move on.

Error 7. Used does with plural

Error explanation

The student used *does* with a plural subject.

Feedback

- Error message: "Birds" is plural. The helping verb must be plural.
  The helping verb in the sentence flashes and stays inverted.
  The *do* answer button flashes.
  Try again.
- Error message: "Do" is the helping verb that agrees with "birds."
  The helping verb in the sentence flashes and stays inverted.
  The *do* answer button flashes.
  Try again.
- Error message: Here is the correct question.
  The correct question is displayed—animated if possible.
  Move on.

Error 8. Used do with singular

Error explanation

The student used *does* with a plural subject.

Feedback

- Error message: "Bird" is singular. The helping verb must be singular.
  The helping verb in the sentence flashes and stays inverted.
  The *does* answer button flashes.
  Try again.
- Error message: "Does" is the helping verb that agrees with "bird."
  The helping verb in the sentence flashes and stays inverted.
  The *does* answer button flashes and stays highlighted.
  Try again.
- Error message: Here is the correct question.
  The correct question is displayed—animated if possible.
  Move on.

Error 9. Used did with present

Error explanation

The student used *did* with a present adverbial of time.

Feedback

- Error message: With "now" use a helping verb in present tense.
  The adverbial of time in the sentence is underlined.
  The helping verb in the sentence flashes and stays inverted.
  The present tense helping verb buttons flash.
  Try again.
- Error message: With "now" use the present tense, "does."
  The adverbial of time in the sentence is underlined.
  The helping verb in the sentence flashes and stays inverted.
  The present tense helping verb buttons flash.
  Try again.
- Error message: Here is the correct question.
  The correct question is displayed—animated if possible.
  Move on.

Error 10. Used do or does with past

Error explanation

The student used do or does with a past adverbial of time.

Feedback

- Error message: With "then" use a helping verb in past tense.
  The adverbial of time in the sentence is underlined.
  The helping verb in the sentence flashes and stays inverted.
  The did button(s) flashes.
  Try again.

- Error message: With "then" use the past tense, "did."
  The adverbial of time in the sentence is underlined.
  The helping verb in the sentence flashes and stays inverted.
  The did button(s) flashes and stays inverted.
  Try again.
- Error message: Here is the correct question.
  The correct question is displayed—animated if possible.
  Move on.

Error 11. Helping verb not first

Error explanation

The student did not put the helping verb at the beginning the question.

Feedback

- Error message: Put the helping verb at the beginning of the question.
  The helping verb in the sentence flashes and stays inverted.
  An arrow points to the beginning of the sentence.
  Try again.
- Error message: Begin your question with the helping verb, "does."
  The helping verb in the sentence flashes and stays inverted.
  An arrow points to the beginning of the sentence.
  Try again.
- Error message: Here is the correct question.
  The correct question is displayed—animated if possible.
  Move on.

Error 12. Used two main verbs

Error explanation

The student includee two main verbs in the question.

Feedback

- Error message: Use the main verb only once.
  The two main verbs in the sentence flash.
  The correct main verb button highlights.
  Try again.
- Error message: Use only the main verb, "eat," in your sentence.
  The two main verbs in the sentence flash.
  The correct main verb button highlights.
  Try again.
- Error message: Here is the correct question.
  The correct question is displayed—animated if possible.
  Move on.

Error 13. Didn't use simple form of verb

Error explanation

The student did not use the simple form of the main verb.

Feedback

- Error message: Use the simple form of the verb, "eat.".
  The helping verb and main verb in the sentence are underlined.
  The ending of the main verb is Xed out.
  The simple form of the main verb button is flashed.
  Try again.
- Error message: Use "eat," with the helping verb.
  The helping verb and main verb in the sentence are underlined.
  The ending of the main verb is Xed out.
  The simple form of the main verb button flashes and stays highlighted.
  Try again.
- Error message: Here is the correct question.
  The correct question is displayed—animated if possible.
  Move on.

Error 14. Main verb before subject

Error explanation

The student put the main verb before the subject.

Feedback

- Error message: Put the subject before the main verb, "eat."
  The subject in the sentence flashes and stays inverted.
  An arrow points to correct subject position.
  Try again.
- Error message: Put "birds" before the main verb, "eat."
  The subject in the sentence flashes and stays inverted.
  An arrow points to correct subject position.
  Try again.
- Error message: Here is the correct question.
  The correct question is displayed—animated if possible.
  Move on.

Error 15. Adverbial of time out of place

Error explanation

The student did not put the adverbial of time at the end of the sentence.

Feedback

- Error message: Put the time phrase, "every Monday" last.
  The adverbial of time in the sentence flashes and stays inverted.
  An arrow points to the end of the sentence.
  Try again.
- Error message: Put "every Monday" last.
  The adverbial of time in the sentence flashes and stays inverted.
  An arrow points to the end of the sentence.
  Try again.
- Error message: Here is the correct question.
  The correct question is displayed—animated if possible.
  Move on.

Error 16. Direct object out of place

Error explanation

The student did not put the direct object after the main verb.

Feedback

- Error message: Put the direct object, "worms," after the main verb.
  The direct object in the sentence flashes and stays inverted.
  An arrow points to the space after the main verb.
  Try again.
- Error message: Put "worms" after the main verb.
  The direct object in the sentence flashes and stays inverted.
  An arrow points to the space after the main verb.
  Try again.
- Error message: Here is the correct question.
  The correct question is displayed—animated if possible.
  Move on.

Error 17. Used a period at end of question

Error explanation

The student ended the question with a period instead of a question mark.

Feedback

- Error message: A question ends with a question mark, not a period.
  The period in the sentence flashes.
  The question mark button flashes.
  Try again.
- Error message: Use a question mark at the end of your question .
  The period in the sentence flashes.
  The question mark button flashes.

Try again.
- Error message: Here is the correct question.
  The correct question is displayed—animated if possible.
  Move on.

Error 18. No question mark

Error explanation

The student did not include a question mark in the question.

Feedback

- Error message: A question ends with a question mark.
  The question mark button flashes and stays highlighted.
  An arrow points to the end of the sentence.
  Try again.
- Error message: A question ends with a question mark.
  The question mark button flashes and stays highlighted.
  An arrow points to the end of the sentence.
  Try again.
- Error message: Here is the correct question.
  The correct question is displayed—animated if possible.
  Move on.

Error 19. Incorrect word order

Error explanation

The student did not include any helping verb in the question.

Feedback

- Error message: The words are in the wrong order.
  Try again.
- Error message: The words are in the wrong order.
  Try again.
- Error message: Here is the correct question.
  The correct question is displayed.
  Move on.

Suggested Improvements for the Implementation of *The Yes-No Game*

Implementing an application requires the programmer to make many organizational decisions. Unfortunately, these decisions must be made before the programmer knows the size and complexity of the application's various parts. Only after completing the application does the programmer have the proper perspective to organize the application code optimally.

Object-oriented programming (OOP), which requires more organization than conventional programming, can accentuate this problem. OOP organizes programs around *objects* rather than procedures. The programmer divides the responsibilities of the application among the objects. Often an object ends up with too many or too few responsibilities, or perhaps different objects have similar responsibilities, or one object has disparate responsibilities.

A good object organization leads to simpler code that is easy to maintain and extend. This document suggests improvements to the object structure of *The Yes-No Game*.

Human Interface

The human interface of *The Yes-No Game* currently relies on MacApp's document object. This object implements the standard Macintosh interface for file manipulation. Unfortunately, the standard Macintosh interface is not appropriate for *The Yes-No Game* because the users of *The Yes-No Game* are generally not familiar with Macintosh. An example of this interface is the "Standard File" box—the dialog box that appears when the application is first opened. This box is unnecessarily difficult for the *Yes-No* user and in fact must be handled by the administrator.

A new document class that presented file information in a Yes-No screen or perhaps hid it completely in a menu would improve this situation.

Text

The Yes-No Game currently contains a large number of *utility objects* (low-level objects that high-level objects use to complete their tasks). Many of these utility objects deal with text — in the sentences, questions, guesses, instructions, and animated examples. The low-level text objects are limited in their abilities. Thus, the high-level objects must make up for their limited tools. In particular, a more complete set of animated text objects (including unlimited fonts, sizes, and number of lines) would reduce the programming required in many areas of the application.

Pictures

Another set of utility objects draw the pictures on the screen. These objects are fairly complex in the current version of *The Yes-No Game* due to the lack of a consistent picture database. If the pictures were modified to reflect anchor points more consistently, the picture objects could be simplified.

Screens

Four different types of objects are currently responsible for handling screen changes in *The Yes-No Game*— the document, screen helper, status helper, and view objects. The document object asks the screen helper if it should change the screen. The screen helper sees if it is time to change the screen and, if so, asks the status helper which screen comes next. Then, the screen helper reports its result to the document which creates a view object to represent the screen. This scheme works well for a small number of screens. Unfortunately, as the number of screens grew, each of these four objects needed to know more information.

A better design would localize the new information when a screen is added to *The Yes-No Game*. One possible solution is screen objects. These objects would be responsible for initializing themselves, creating views to represent themselves on the screen, and knowing when to go to the next screen. The document would only be responsible for opening and closing these screen objects. With a hierarchical object design, the document would only need to know how to open and close a generic screen object; the actual screen object would do the rest of the work.

Another possible optimization is making the transitions between screens faster—particularly the chooser and interactive screens. This transition is slow because many new objects are created to handle the new screen. A library object could create these objects at startup time, and then "check them out" when they were needed. Checking out an object would take substantially less time than creating one.

Records

The Yes-No Game has many record-keeping requirements including the report card, the transcript, the information needed to decide what question types to offer, and the information needed to decide promotion and remediation. Different objects handle these functions currently. This information could be localized in one large record-keeping object, or at least a closely-related set of record-keeping objects. One great advantage to this solution is that it would be possible to place a student exactly where they left off in the application. Even if this were not required by the instructional design, it would save countless hours when debugging *The Yes-No Game*, as each situation could be tested quickly.

APPENDIX 5

Tests developed for the AVM Project

Diagnostic Test of Negative and Interrogative Patterns

Seven tests forms: screening, pre- and post-tests for *Yes-No I and II*

School____________________ Name______________________________

Grade________ Age_______

DIAGNOSTIC TEST

Negative and Interrogative Patterns

Read each group of four (4) statements or four (4) questions. Only one of the sentences is correct. Choose the correct one.

Example 1. Choose one:

A. The apple is not red.
B. The apple is no red.
C. The apple not is red.
D. The apple is red no.

"A" is the correct sentence.
The apple is not red.
Mark the correct letter, "A."

A. The apple is not red.
B. The apple is no red.
C. The apple not is red.
D. The apple is red no.

Example 2. Choose one:

A. Is the milk is in the refrigerator?.
B. The milk in the refrigerator?
C. Is the milk in the refrigerator?
D. Did the milk is in the refrigerator?

"C" is the correct sentence.
Is the milk in the refrigerator?
Mark the correct letter, "C."

A. Is the milk is in the refrigerator?
B. The milk in the refrigerator?
C. Is the milk in the refrigerator?
D. Did the milk is in the refrigerator?

BEGIN THE TEST. For each test item mark the sentence you think is best.

1. A. They have read not the newspaper.
   B. They have not read the newspaper.
   C. They have no read the newspaper.
   D. They am not have read the newspaper.

2. A. Do you want a cup of tea?.
   B. Want you a cup of tea?
   C. Is you want a cup of tea?
   D. Does you want a cup of tea?

3. A. Why you were looking at the sky?
   B. Why were you looking at the sky?
   C. You why were looking at the sky?
   D. Why was you looking at the sky?

4. A. Mary not does have a red jacket.
   B. Mary has a red jacket not.
   C. Mary not has a red jacket.
   D. Mary doesn't have a red jacket.

5. A. Chris not is feeding the dog.
   B. Chris is not feeding the dog.
   C. Chris is feeding the dog not.
   D. Chris is feeding no the dog.

6. A. Are you older than your brother?
   B. Is you are older than your brother?
   C. You was older than your brother?
   D. Did you older than your brother?

7. A. John not has washed the car.
   B. John not washed the car.
   C. John no has washed the car.
   D. John has not washed the car.

8. A. Does Billy does like hamburgers?
   B. Does Billy like hamburgers?
   C. Do Billy like hamburgers?
   D. Does like Billy hamburgers?

CONTINUE THE TEST. For each test item mark the sentence you think is best.

9. A. The girls no did not pick the flowers.
B. The girls did pick the flowers no.
C. The girls not did pick the flowers.
D. The girls did not pick the flowers.

10. A. Grandmother does not eat candy.
B. Grandmother does no eat candy.
C. Grandmother no doesn't eat candy.
D. Grandmother does eat candy not.

11. A. Where Billy goes to school?
B. Where school Billy goes?
C. Billy goes to where school?
D. Where does Billy go to school?

12. A. Not the cat has seen the bird.
B. The cat not has seen the bird.
C. The cat hasn't seen the bird.
D. The cat did has not seen the bird.

13. A. May I drank the milk?
B. Drink I the milk?
C. May I drink the milk?
D. May I may drink the milk?

14. A. Do the students want to study?
B. Were the students want to study?
C. Does the students want to study?
D. Do want the students to study?

15. A. Eggs there are in the refrigerator?
B. Is there eggs in the refrigerator?
C. Are there eggs are in the refrigerator?
D. Are there eggs in the refrigerator?

16. A. We no have a new car.
B. We have a new car not.
C. We don't have a new car.
D. Not we have a new car.

17. A. Was the doctor in his office?
B. Was the doctor was in his office?
C. Are the doctor in his office?
D. Did the doctor was in his office?

18. A. The mouse is not a big animal.
B. Not the mouse is a big animal.
C. The mouse is a big animal no.
D. The mouse not is a big animal.

19. A. Betty does no like bananas.
B. Betty doesn't like bananas.
C. Betty not like bananas.
D. Betty not does like bananas.

20. A. Do Tom can drive a car?
B. Does Tom can drive a car?
C. Can Tom drive a car?
D. Can Tom can drive a car?

21. A. They are not going to the park.
B. They no are not going to the park.
C. They are no going to the park.
D. They are going no to the park.

22. A. The puppies weren't in the backyard.
B. The puppies not were in the backyard.
C. The puppies weren't not in the backyard.
D. Not the puppies were in the backyard.

CONTINUE THE TEST. For each test item mark the sentence you think is best.

23. A. Whose book did find John?
B. John find whose book?
C. Whose book found John?
D. Whose book did John find?

24. A. The eggs not are in the basket.
B. The eggs are not in the basket.
C. Not the eggs are in the basket.
D. The eggs are in the basket no.

25. A. Should sleep pets on the bed?
B. Should pets should sleep on the bed?
C. Sleep pets on the bed?
D. Should pets sleep on the bed?

26. A. Joe was making not the kite.
B. Joe not was making the kite.
C. Joe wasn't making the kite.
D. Joe did was not making the kite.

27. A. The cow no was not in the barn.
B. The cow was in the barn not.
C. Not the cow was in the barn.
D. The cow was not in the barn.

28. A. Did do the boys their homework?
B. Does the boys do their homework?
C. The boys done their homework?
D. Did the boys do their homework?

29. A. They seem angry not.
B. They not seem angry.
C. They do not seem angry.
D. They seem no angry.

30. A. Who sent you a present?
B. Gave you a present who?
C. Who Jim sent you a present?
D. Who you sent a present?

31. A. I not am lying on the bed.
B. I not lying on the bed.
C. I am not lying on the bed.
D. I am no lying on the bed.

32. A. Not mother is making a cake.
B. Mother is no making a cake.
C. Mother isn't making a cake.
D. Mother not making a cake.

33. A. What you had for lunch?
B. You what have for lunch?
C. What did you have for lunch?
D. What you did had for lunch?

34. A. When did Kathy go to the library?
B. Kathy go the the library when?
C. When to the library did Kathy go?
D. When Kathy went to the library?

35. A. Bill not had taken a taxi.
B. Bill not taken a taxi.
C. Bill had taken no a taxi.
D. Bill had not taken a taxi.

36. A. We can not do run in the house.
B. We do run no in the house.
C. We not do run in the house.
D. We do not run in the house.

CONTINUE THE TEST. For each test item mark the sentence you think is best.

37. A. Who the girl found the money?
B. Who found the money?
C. Who she found the money?
D. Found who the money?

38. A. The old lady could open not the door.
B. The old lady not open the door.
C. The old lady could open no the door.
D. The old lady couldn't open the door.

39. A. The birds aren't in the tree.
B. Not the birds are in the tree.
C. The birds are no in the tree.
D. The birds no aren't in the tree.

40. A. Will paint the house the men next week?
B. The men paint the house next week?
C. Is the men paint the house next week?
D. Will the men paint the house next week?

41. A. The boys no play ball in the rain.
B. The boys would play ball in the rain no.
C. The boys wouldn't play ball in the rain.
D. The boys not would play ball in the rain.

42. A. My brother not eat spinach.
B. My brother willn't eat spinach.
C. My brother will not eat spinach.
D. My brother not will eat spinach.

43. A. Billy never does his homework.
B. Billy not never do his homework.
C. Billy never not do his homework.
D. Not never Billy do his homework.

44. A. When you bake the cake?
B. Did you bake the cake when?
C. When you baked the cake?
D. When did you bake the cake?

45. A. Not Dad was at his office.
B. Dad was at his office no.
C. Dad wasn't at his office.
D. Dad was no at his office.

46. A. How did you catch the frog?
B. How did catch you the frog?
C. How you was catch the frog?
D. You catch the frog how?

47. A. Mary do the dishes?
B. Did Mary do the dishes?
C. Mary done the dishes?
D. Did do Mary the dishes?

48. A. Where should we put this plant?
B. Where this plant we should put?
C. This plant where we put?
D. Where we should put this plant?

49. A. The children not are feeding the ducks.
B. The children aren't feeding the ducks.
C. The children are feeding the ducks not.
D. The children no are feeding the ducks.

50. A. Which kitten did Mary choose?
B. Mary choose which kitten?
C. Which kitten Mary choosed?
D. Which kitten was Mary chose?

CONTINUE THE TEST. For each test item mark the sentence you think is best.

51. A. Not the boys did their homework.
B. The boys didn't do their homework.
C. The boys did their homework no.
D. The boys not did their homework.

52. A. Are you writing a letter?
B. Are writing you a letter?
C. You writing a letter?
D. Are you are writing a letter?

53. A. When do Mother makes a cake?
B. When did Mother make a cake?.
C. Mother when did make a cake?
D. Did when Mother make a cake?

54. A. The children did had not found the kitten.
B. Not the children had found the kitten.
C. The children not had found the kitten.
D. The children hadn't found the kitten.

55. A. Were the ducks were in the pond?
B. Did the ducks were in the pond?
C. Was the ducks in the pond?
D. Were the ducks in the pond?

56. A. What will I feed the dog?
B. What will I feed the dog meat?
C. What will I fed the dog?
D. What the dog will I feed?

57. A. Not Mom will buy the candy.
B. Mom will not can buy the candy.
C. Mom willn't buy the candy.
D. Mom won't buy the candy.

58. A. Is the coffee hot?
B. The coffee hot?
C. Do the coffee is hot?
D. Is the coffee is hot?

59. A. How many hamburgers you ate?
B. You ate hamburgers how many?
C. How many hamburgers did you eat?
D. How many hamburgers did you ate?

60. A. Baby birds can't fly.
B. Baby birds not fly.
C. Baby birds not can fly.
D. Baby birds can no fly.

61. A. The girls can not were feeding the fish.
B. The girls weren't feeding the fish.
C. The girls were no feed the fish.
D. The girls were not feed the fish.

62. A. What did Jimmy hear?
B. What did Jimmy heard?
C. What Jimmy hear?
D. What Jimmy did hear?

63. A. The boys not have had dinner.
B. The boys have not had dinner.
C. The boys have had dinner no.
D. Not the boys have had dinner.

64. A. What played the girls at the park?
B. What the girls played at the park?
C. What did the girls play at the park?
D. The girls what they played at the park?

CONTINUE THE TEST. For each test item mark the sentence you think is best.

65. A. The fish were no in the bowl.
B. The fish were not in the bowl.
C. The fish were in the bowl not.
D. The fish not were in the bowl.

66. A. Could Billy ride the bicycle?
B. Could Billy rode the bicycle?
C. Did Billy could ride the bicycle?
D. Am Billy could ride the bicycle?

67. A. The dog did may not sleep on the bed.
B. The dog may not sleep on the bed.
C. The dog not sleep on the bed.
D. The dog may no sleep on the bed..

68. A. Was the baby was laughing?
B. Were the baby laughing?
C. Was the baby laughing?
D. The baby laughing?

69. A. Did I am a hard worker?
B. Am I a hard worker?
C. Am I am a hard worker??
D. I a hard worker?

Decide what these sentences tell us. Choose one of the four answers. Mark the best answer.

70. Mary cried. She was not happy.

A. Mary did not cry.
B. Mary was sad.
C. Mary was not sad.
D. Mary was happy.

71. The puppy had not had his supper. He was crying.

A. The puppy was hungry.
B. The puppy was not hungry.
C. The puppy didn't cry.
D. The puppy did not want supper.

72. The boys built a playhouse. It is not big.

A. The playhouse is big.
B. The playhouse is not small.
C. The boys did not build a playhouse.
D. The playhouse is small.

73. The children wanted to go to the zoo. It was raining.

A. The children went to the zoo.
B. The children didn't go to the zoo.
C. It wasn't raining.
D. The children didn't want to go to the zoo.

74. Jim was sick. He did not go to the party.

A. Jim was not sick.
B. Jim did not stay at home.
C. Jim went to the party.
D. Jim stayed at home.

Read the question. Decide which of the four answers is correct. Mark the best answer.

75. Do chickens lay eggs?.
A. eggs
B. in nests
C. Chickens lay eggs.
D. Yes, they do.

76. What time is dinner?
A. in school
B. the boy
C. on 6 o'clock
D. at 6 o'clock

77. Sally likes cake, doesn't she?
A. doesn't like
B. chocolate cake
C. Yes, she does.
D. doesn't

78. Whose painting do you like best?
A. Bill's
B. You like Bill's painting.
C. the beautiful flowers
D. Bill

79. Could Jack keep the snake?
A. Yes, he did.
B. Yes, he could.
C. He will buy the snake.
D. Jack keep the snake.

80. Which are bigger, mice or elephants?
A. They are bigger.
B. elephants
C. heavy
D. smaller

81. Jessie can't play the game, can she?
A. No, she can't.
B. the game
C. can
D. can't play

82. How long did Mary watch the baby?
A. Mary watched the baby.
B. all day
C. the baby
D. on the bed

83. Why is the girl crying?
A. The story is sad.
B. a sad story
C. because the girl is funny
D. She likes the story.

84. What happened to Betty?
A. happened
B. She hurt her leg.
C. at school
D. She is hungry.

85. How did Tom feel when he found his wallet?
A. because he was happy
B. very happy
C. His brother took it.
D. He told Mother.

86. When did Allen write the story?
A. Yes, he did.
B. on the desk
C. on Tuesday
D. with a typewriter

CONTINUE THE TEST. Mark the best answer.

87. Is the giraffe a tall animal?
- A. in the zoo
- B. tall animal
- C. The giraffe is tall.
- D. yes

88. Whose book did David find?
- A. on the floor
- B. teacher
- C. the math book
- D. the teacher's

89. How far is it to the city?
- A. very far
- B. on the highway
- C. far away
- D. no, not very far

90. The twins went to the park, didn't they?
- A. went to the park
- B. did
- C. No, they didn't.
- D. the twins

91. How do you know that Linda went to the store?
- A. She is good.
- B. I saw her go.
- C. in the bus
- D. Linda walked to the store.

92. What kind of bike does John have?
- A. yes
- B. blue kind
- C. a blue one
- D. John has a bike.

93. How many cats does Mary have?
- A. 4
- B. black cats
- C. yes
- D. in her bedroom

94. Why did Bill run to school?
- A. He was fast.
- B. He was tired.
- C. so that he could run
- D. He was late.

95. Ellen was happy yesterday, wasn't she?
- A. Yes, she did.
- B. happy
- C. Yes, she was.
- D. wasn't happy.

96. How often do you go to church?
- A. every Sunday
- B. I walk to church.
- C. I sing in church.
- D. not on Sunday

97. Where will the team play the game?
- A. in the park
- B. on Saturday
- C. The boys will.
- D. play in the park

98. The men didn't drive to work, did they?
- A. to work
- B. No, they didn't.
- C. didn't drive
- D. the men

99. Which bird belongs to the boy?
- A. a bird house
- B. The boy found the bird.
- C. from the pet shop
- D. the yellow bird

100. Who played in the backyard?
- A. They played baseball.
- B. the baseball
- C. the children
- D. They ran in the park.

Name ______________________________ School ______________________________

Age ______________________________ Grade ______________________________

SCREENING TEST

Read the questions carefully. You should finish the test within the class period. If you finish early, please review your answers carefully.

Part I

Read each group of four (4) questions. Only one of the questions is correct. Choose and mark the correct one.

Example1. Choose the correct question.
A. Was the baby was laughing?
B. Were the baby laughing?
C. Was the baby laughing?
D. The baby laughing?

"C" is the correct question.
Was the baby laughing?
Mark the correct letter, "C."

A. Was the baby was laughing?
B. Were the baby laughing?
[✓ C.] Was the baby laughing?
D. The baby laughing?

Example2. Choose the correct question.
A. Bill a tall boy?
B. Did Bill is a tall boy?
C. Is Bill is a tall boy?
D. Is Bill a tall boy?

"D" is the correct question.
Is Bill a tall boy?
Mark the correct letter, "D."

A. Bill a tall boy?
B. Did Bill is a tall boy?
C. Is Bill is a tall boy?
[✓ D.] Is Bill a tall boy?

BEGIN PART I. For each test item mark the question that you think is correct.

1. A. You were looking at the sky?
   B. You looking at the sky?
   C. Were you looking at the sky?
   D. Was you looking at the sky?

2. A. Your friend's name John?
   B. Is your friend's name John?
   C. Is your friend's name is John?
   D. Did your friend's name is John?

3. A. Is you are older than your brother?
   B. You was older than your brother?
   C. Are you older than your brother?
   D. Did you older than your brother?

4. A. Is Dad cutting the grass?
   B. Is Dad is cutting the grass?
   C. Is Dad cut the grass?
   D. Did Dad cutting the grass?

5. A. Were the boys were at the zoo?
   B. Did the boys were at the zoo?
   C. Was the boys at the zoo?
   D. Were the boys at the zoo?

6. A. Was the doctor was in his office?
   B. Was the doctor in his office?
   C. Are the doctor in his office?
   D. Did the doctor was in his office?

7. A. Are you are tired of swimming?
   B. Do you are tired of swimming?
   C. Are you tired of swimming?
   D. Is you are tired of swimming?

8. A. Do the children are feeding the ducks?
   B. Are the children feeding the ducks?
   C. Is the children are feeding the ducks?
   D. The children are feeding the ducks?

9. A. Do the kittens are sleeping on the bed?
B. The kittens sleeping on the bed?
C. Is the kittens sleeping on the bed?
D. Are the kittens sleeping on the bed?

10. A. Are you making ice cream for dessert?
B. Are making you ice cream for dessert?
C. You making ice cream for dessert?
D. Are you are making ice cream for dessert?

11. A. You was taller than Dad?
B. Is you are taller than Dad?
C. Are you taller than Dad?
D. Did you taller than Dad?

12. A. You were at the dance last night?
B. Was you at the dance last night?
C. Were you at the dance last night?
D. Did you were at the dance last night?

13. A. Is the cup of coffee hot?
B. The cup of coffee hot?
C. Do the cup of coffee is hot?
D. Is the cup of coffee is hot?

14. A. Did we going we to the party tomorrow?
B. Are we going to the party tomorrow?
C. We going to the party tomorrow?
D. Are we are going to the party tomorrow?

15. A. Is you are writing a letter to your friend?
B. Are writing you a letter to your friend?
C. Are you write a letter to your friend?
D. Are you writing a letter to your friend?

16. A. Was the girls driving to San Francisco?
B. Were the girls drive to San Francisco ?
C. Were the girls driving to San Francisco?
D. Were the girls were driving to San Francisco?

17. A. Is Mother baking a cake for dinner tonight?
B. Do Mother baking a cake for dinner tonight?
C. Is Mother bake a cake for dinner tonight?
D. Did Mother is baking a cake for dinner tonight?

18. A. The oranges were in the bag?
B. Were the oranges were in the bag?
C. Is the oranges in the bag?
D. Were the oranges in the bag?

19. A. Did Sue and Ann jogging to the park?
B. Are Sue and Ann jogging to the park?
C. Are Sue and Ann are jogging to the park?
D. Are jogging Sue and Ann to the park?

20. A. Was Eve was happy at her birthday party?
B. Eve was happy at her birthday party?
C. Did Eve was happy at her birthday party?
D. Was Eve happy at her birthday party?

21. A. Was Sally play soccer yesterday?
B. Sally playing soccer yesterday?
C. Was Sally playing soccer yesterday?
D. Did Sally playing soccer yesterday?

22. A. Are the girls are at the movies?
B. Do the girls are at the movies?
C. Is the girls at the movies?
D. Are the girls at the movies?

23. A. Are Father making salad for lunch?
B. Is Father make salad for lunch?
C. Father making salad for lunch?
D. Is Father making salad for lunch?

24. A. Are the new computers are in the lab?
B. Do the new computers in the lab?
C. Are the new computers in the lab?
D. Is the new computers in the lab?

25. A. Were the boy running to catch the bus?
B. Was the boy running to catch the bus?
C. Was running the boy to catch the bus?
D. Was the boy was running to catch the bus?

END of PART I - Please Continue to Part II

Part II

Part II contains 10 very short paragraphs. First, read each paragraph. Then, write the question that fits the paragraph. Look at the next two examples to see what kind of questions you should write.

Example 1:
It's nearly lunch time, and I'm very hungry. I wonder if my roomate is hungry too.

I ask my roommate, "______________________________?"

The correct question is: **Are you hungry ?**
Now, write the correct question on the blank line above.

Example 2:
The family is sitting down to dinner. Dad isn't home yet. Bill wonders if his Dad is working late tonight.

Bill asks his mother, "______________________________?"

The correct question is: **Is Dad working late tonight?**
Now, write the correct question on the blank line above.

BEGIN PART II. For each short paragraph, write the correct question on the blank line.

1. You didn't come to class yesterday. Maybe you were sick. I'm not sure.

   I ask you, "______________________________?"

2. It's Saturday afternoon and Dad is watching TV. Usually on Saturdays, Dad watches a football game. I don't know if Dad is watching a football game now.

   I ask Dad, "______________________________?"

3. Joe wants to take Beth on a picnic in the woods. There may be snakes in the woods! Joe doesn't know if Beth is afraid of snakes.

   Joe asks Beth's best friend, "______________________________?"

4. This morning Mom stayed home from work because she did not feel well. I just came home from school and saw Mom drive away. Maybe Mom is feeling better.

   I ask Dad, "______________________________?"

5. June invited Mike and his girlfriend to her party on Saturday, but June doesn't know if they are coming.

June asks Mike's roommate, "____?"

6. Mother made too much soup this week. We had it for dinner yesterday and the day before. I hope that we are not having soup again for dinner, but I see mother reheating the soup.

I ask Mother, "____?"

7. Joe is very tall and athletic. Sue thinks that Joe looks like a basketball player, but she doesn't know if he is a basketball player.

Sue asks Joe's roommate, "____?"

8. Our kitten likes to walk on the coffee table, but we always chase her away. Today, I found paw prints on the table. Maybe the kitten was walking on the table again.

I wonder, "____?"

9. I saw Dick's dog run into the street and get hit by a car. I am afraid that the dog was badly hurt.

I ask Dick, "____?"

10. At 8 p.m. Bill arrives at Peggy's party. He hopes his friends, Joe and Pat, are at the party.

Bill asks Peggy, "____?"

END of TEST

Thank you for participating in the Screening Test.

Name ______________________ School ______________________

Age ______________________ Grade ____ Teacher ______________

POST TEST

Read the questions carefully. You should finish the test within the class period. If you finish early, please review your answers carefully.

Part I

Read each group of four (4) questions. Only one of the questions is correct. Choose and mark the correct one.

Example 1. Choose the correct question.
A. Was the baby was laughing?
B. Were the baby laughing?
C. Was the baby laughing?
D. The baby laughing?

"C" is the correct question.
Was the baby laughing?
Mark the correct letter, "C."

A. Was the baby was laughing?
B. Were the baby laughing?
[✓ C.] Was the baby laughing?
D. The baby laughing?

Example 2. Choose the correct question.
A. Bill a tall boy?
B. Did Bill is a tall boy?
C. Is Bill is a tall boy?
D. Is Bill a tall boy?

"D" is the correct question.
Is Bill a tall boy?
Mark the correct letter, "D."

A. Bill a tall boy?
B. Did Bill is a tall boy?
C. Is Bill is a tall boy?
[✓ D.] Is Bill a tall boy?

BEGIN PART I. For each test item mark the question that you think is correct.

1. A. Are the new dishes are on the table?
B. Do the new dishes on the table?
C. Are the new dishes on the table?
D. Is the new dishes on the table?

2. A. Was the artist was in his studio?
B. Was the artist in his studio?
C. Are the artist in his studio?
D. Did the artist was in his studio?

3. A. You was shorter than your brother?
B. Is you are shorter than your brother?
C. Are you shorter than your brother?
D. Did you shorter than your brother?

4. A. Is the bowl of soup cold?
B. The bowl of soup cold ?
C. Do the bowl of soup is cold?
D. Is the bowl of soup is cold?

5. A. Your sister's name Joan?
B. Did your sister's name is Joan?
C. Is your sister's name is Joan?
D. Is your sister's name Joan?

6. A. Do the men are fixing the roof?
B. Are the men fixing the roof?
C. Is the men are fixing the roof?
D. The men are fixing the roof?

7. A. You were at the party last Saturday?
B. Was you at the party last Saturday?
C. Were you at the party last Saturday?
D. Did you were at the party last Saturday?

8. A. Are planning you a party for your friend?
B. Are you planning a party for your friend?
C. Are you plan a party for your friend?
D. Is you are planning a party for your friend?

9. A. The tickets were in your pocket?
B. Were the tickets were in your pocket?
C. Is the tickets in your pocket?
D. Were the tickets in your pocket?

10. A. Are you making a present for your mom?
B. Are making you a present for your mom?
C. You making a present for your mom?
D. Are you are making a present for your mom?

11. A. Was Jill visit her aunt yesterday?
B. Jill visiting her aunt yesterday?
C. Was Jill visiting her aunt yesterday?
D. Did Jill visiting her aunt yesterday?

12. A. You were laughing at the joke?
B. You laughing at the joke?
C. Were you laughing at the joke?
D. Was you laughing at the joke?

13. A. Is Grandma taking a nap?
B. Is Grandma is taking a nap?
C. Is Grandma take a nap?
D. Did Grandma taking a nap?

14. A. Did Ken and Barbie biking to the beach?
B. Are Ken and Barbie biking to the beach?
C. Are biking Ken and Barbie to the beach?
D. Are Ken and Barbie are biking to the beach?

15. A. Are Jamie making hamburgers for lunch?
B. Is Jamie make hamburgers for lunch?
C. Jamie making hamburgers for lunch?
D. Is Jamie making hamburgers for lunch?

16. A. Was your parents driving to New York?
B. Were your parents drive to New York?
C. Were your parents driving to New York?
D. Were your parents were driving to New York?

17. A. Was the quarterback tyring to throw a pass?
B. Was the quarterback was trying to throw pass?
C. Was trying to throw the quarterback a pass?
D. Were the quarterback trying to throw a pass?

18. A. Do the frogs are swimming in the pool?
B. The frogs swimming in the pool?
C. Is the frogs swimming in the pool?
D. Are the frogs swimming in the pool?

19. A. Did we going to the dance on Friday?
B. Are we going to the dance on Friday?
C. We going to the dance on Friday?
D. Are we are going to the dance on Friday?

20. A. Are the boys are at the bowling alley?
B. Do the boys are at the bowling alley?
C. Is the boys at the bowling alley?
D. Are the boys at the bowling alley?

21. A. Is you are younger than your cousin?
B. You was younger than your cousin?
C. Are you younger than your cousin?
D. Did you younger than your cousin?

22. A. Were the students were at the museum?
B. Did the students were at the museum?
C. Was the students at the museum?
D. Were the students at the museum?

23. A. Was Bob was happy at his surprise party?
B. Bob was happy at his surprise party?
C. Did Bob was happy at his surprise party?
D. Was Bob happy at his surprise party?

24. A. Are you are bored with studying?
B. Do you are bored with studying?
C. Are you bored with studying?
D. Is you are bored with studying?

25. A. Do Dad cooking soup for dinner tonight?
B. Is Dad cooking soup for dinner tonight?
C. Is Dad cook soup for dinner tonight?
D. Did Dad is cooking soup for dinner tonight?

END of PART I - Please Continue to Part II

Part II

Part II contains 10 very short paragraphs. First, read each paragraph. Then, write the question that fits the paragraph. Look at the next two examples to see what kind of questions you should write.

Example 1:
It's a hot day, and I'm very thirsty. I think maybe my roommate is thirsty too.

I ask my roommate, "____?"

The correct question is: **Are you thirsty?**
Now, write the correct question on the blank line above.

Example 2:
The family is sitting down to dinner. Dad isn't home yet. Bill isn't sure if his Dad is working late tonight.

Bill asks his mother, "____?"

The correct question is: **Is Dad working late tonight?**
Now, write the correct question on the blank line above.

BEGIN PART II. For each short paragraph, write the correct question on the blank line.

1. You didn't meet me for lunch yesterday. Maybe you were sick. I'm not sure.

   I ask you, "____?"

2. Mom is watching the late show on TV. I see her eyes are closed. Maybe she is falling asleep.

   I ask Mom, "____?"

3. Sam wants to take Jody to the art museum. Sam doesn't know if Jody is interested in paintings.

   Sam asks Jody's best friend, "____?"

4. This morning my brother Chris stayed home from work because he had a toothache. I just came home from school and saw Chris drive away. Maybe Chris is going to the dentist.

   I ask Dad, "____?"

5. Ellen has an important test tomorrow. She usually studies hard for every test. Maybe she is studying tonight.

I ask Ellen's best friend, "____?"

6. Mother usually makes chicken or roast beef for Sunday dinner. I like roast beef better. I hope we're having roast beef this Sunday.

I ask Mother, "____?"

7. I saw my friend Mark talking to a boy named Steve. Steve looks a lot like Mark. Maybe Steve is Mark's brother.

I ask Mark, "____?"

8. When I called my friend Bill, the phone rang a long time before she answered. Maybe he was sleeping.

I ask Bill, "______________________________ ______________?"

9. I want to buy my grandmother some flowers for her birthday, but I'm afraid they're too expensive.

I ask the florist, "____?"

10. I got a ride home from school in my friend Ted's car. Now I can't find my books. Maybe they're in Ted's car.

I call Ted and ask, "____?"

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END of TEST

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Thank you for participating in the Post Test.

Name ____________________ School ____________________

Age ____________________ Grade ____ Teacher ____________

PRE-TEST

Read the questions carefully. You should finish the test within the class period. If you finish early, please review your answers carefully.

Part I

Read each group of four (4) questions. Only one of the questions is correct. Choose and mark the correct one.

Example 1. Choose the correct question.
A. Did Tom watch the game yesterday?
B. Is Tom watched the game yesterday?
C. Did Tom watched the game yesterday?
D. Watched Tom the game yesterday?

"A" is the correct question.
Was the baby laughing?
Mark the correct letter, "A."

[✓ A.] Did Tom watch the game yesterday?
B. Is Tom watched the game yesterday?
C. Did Tom watched the game yesterday?
D. Watched Tom the game yesterday?

Example 2. Choose the correct question.
A. Does the sky looks blue?
B. Do the sky looks blue?
C. Does the sky look blue?
D. Is the sky looks blue?

"C" is the correct question.
Is Bill a tall boy?
Mark the correct letter, "C."

A. Does the sky looks blue?
B. Do the sky looks blue?
[✓ C.] Does the sky look blue?
D. Is the sky looks blue?

BEGIN PART I. For each test item mark the question that you think is correct.

1. A. Does you drive to work every day?
B. Drive you to work every day?
C. Is you drive to work every day?
D. Do you drive to work every day?

2. A. Snows in January?
B. Is it snows in January?
C. Does it snow in January?
D. Does it snows in January?

3. A. Did Mom grow flowers last summer?
B. Do Mom grow flowers last summer?
C. Mom grow flowers last summer?
D. Did Mom did grow flowers last summer?

4. A. Your dog chase cats?
B. Does your dog chase cats?
C. Is your dog chases cats?
D. Does your dog chases cats?

5. A. You locked the door last night?
B. Did you lock the door last night?
C. You was lock the door last night?
D. Did lock you the door last night?

6. A. Do you watch movies every night?
B. Does you watched movies every night?
C. Do you watched movies every night?
D. Do watch you movies every night?

7. A. Did the ship sinks in the storm?
B. The ship sink in the storm?
C. Did the ship sink in the storm?
D. Was the ship sink in the storm?

8. A. Do bears sleep in winter?
B. Do sleep bears in winter?
C. Sleep bears in witner?
D. Bears sleep in winter?

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9. A. Does you ski every winter?
   B. Do you ski every winter?
   C. You ski every winter?
   D. You do ski every winter?

10. A. Did jump the horse the fence?
    B. Did the horse jumped the fence?
    C. The horse jumped the fence?
    D. Did the horse jump the fence?

11. A. You use your TTY every day?
    B. Does you use your TTY every day?
    C. Do you use your TTY every day?
    D. Do you used you TTY every day?

12. A. Does the teacher give a quiz every week?
    B. Do the teacher give a quiz every week?
    C. Do give the teacher a quiz every week?
    D. Is the teacher gives a quiz every week?

13. A. You buy a car yesterday?
    B. Did you buy a car yesterday?
    C. Did you did buy a car yesterday?
    D. Buy you a car yesterday?

14. A. Is Cathy write for the school paper?
    B. Do Cathy write for the school paper?
    C. Cathy write for the school paper?
    D. Does Cathy write for the school paper?

15. A. Does the boys ride horses in the park?
    B. Are the boys ride horses in the park?
    C. Do the boys ride horses in the park?
    D. Do ride the boys horses in the park?

16. A. Did go Jeff to the game last night?
    B. Does Jeff go to the game last night?
    C. Jeff go to the game last night?
    D. Did Jeff go to the the game last night?

17. A. Do students go to dances on week nights?
    B. Do students do go to dances on week nights?
    C. Does students go to dances on week nights?
    D. Were students go to dances on week nights?

18. A. Did remember we to do the homework?
    B. We remember to do the homework?
    C. Did we remembered to do the homework?
    D. Did we remember to do the homework?

19. A. Does Ben ride his motorbike to school?
    B. Does ride Ben his motorbike to school?
    C. Ben rides his motorbike to school?
    D. Do Ben ride his motorbike to school?

20. A. Do want you to play tennis tomorrow?
    B. Do you want to play tennis tomorrow?
    C. Is you want to play tennis tomorrow?
    D. Does you want to play tennis tomorrow?

21. A. Does dance Carol in the ballet?
    B. Does Carol does dance in the ballet?
    C. Does Carol dance in the ballet?
    D. Is Carol dances in the ballet?

22. A. Dad planted the tomatoes yesterday?
    B. Did Dad planted the tomatoes yesterday?
    C. Was Dad plant the tomatoes yesterday?
    D. Did Dad plant the tomatoes yesterday?

23. A. Does Bob swim in the Deaf Olympics?
    B. Bob swim in the Deaf Olympics?
    C. Is Bob swim in the Deaf Olympics?
    D. Do Bob swim in the Deaf Olympics?

24. A. Are you play volleyball at school?
    B. Do play you volleyball at school?
    C. Do you play volleyball at school.?
    D. Do you plays volleyball at school?

25. A. Is Mom put garlic in the spaghetti sauce?
    B. Does Mom put garlic in the spaghetti sauce?
    C. Do Mom put garlic in the spaghetti sauce?
    D. Does put Mom garlic in the spaghetti sauce?

END of PART I - Please Continue to Part II

Part II

Part II contains 10 very short paragraphs. First, read each paragraph. Then, write the question that fits the paragraph. Look at the next two examples to see what kind of questions you should write.

Example 1:
Bill and Betty invite Joe and Sue to go bowling. Bill is not sure if Sue likes bowling.

Bill asks Joe, "____?"

Now, write the correct question on the blank line above.

The correct question is: **Does Sue like bowling?**

Example 2:
Harry and Bob are very busy in their office. Harry is going to the cafeteria to get a sandwich for lunch. Bob often wants a sandwich, too. Harry wonders if Bob wants a sandwich today.

Now, write the correct question on the blank line below.

Harry asks Bob, "____?"

The correct question is: **Do you want a sandwich today?**

Example 3:
Sara loves the muffins she had for breakfast. Sara wonders if the muffins are from the bakery, or if her mother baked them this morning.

Now, write the correct question on the blank line below.

Sara asks her father, "____?"

The correct question is: **Did Mother bake the muffins this morning?**

BEGIN PART II. For each short paragraph, write the correct question on the blank line.

1. Lisa plans to bake an angel cake for Don's birthday. She hopes he likes angel cake.

   Lisa asks Don, "____?"

2. Ken is planning to take Barbie out to dinner for her birthday. Ken would like to go to a Mexican restaurant, but he doesn't know if Barbie like Mexican food.

   Ken asks Barbie's friend, "____?"

3. Yesterday there were a lot of flowers in the garden. Today there are only a few. Maybe someone picked the flowers last night.

   I ask Mother, "____?"

4. Jodie has an important exam tomorrow. Tonight she is studying in the library. I wonder if Jodie studies in the library before every exam.

I ask Jodie's roommate, "____?"

5. Anne and Susan are talking on the TTY about the Prom on Saturday. Anne wants to know if Susan bought a new dress for the Prom.

Anne asks Susan, "____?"

6. Jerry has a big bandage on his arm. I know he had a motorcycle accident last week. Maybe he hurt his arm in the accident.

I ask Jerry, "____?"

7. Joan doesn't understand all the problems in the math homework. She is worried about problem 9. Joan thinks Dick understands problem 9.

Joan asks Dick, "____?"

8. Jack is getting coffee for Lori and her friend Kate. Jack doesn't know if Kate uses sugar or cream in her coffee.

Jack asks Lori, "____?"

9. Our new puppy likes to chew up paper. I can't find the newspaper. Maybe the puppy chewed it up.

I ask my family, "____?"

10. Tom is looking for someone to play golf with on Sunday. He thinks Luke might want to play golf at Pebble Beach.

Tom asks Luke, "____?"

••

END of TEST

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Thank you for participating in the Pre-Test.

Name ______________________________ School ______________________________

Age ______________________________ Grade ____ Teacher ________________

POST-TEST 1

Read the questions carefully. You should finish the test within the class period. If you finish early, please review your answers carefully.

Part I

Read each group of four (4) questions. Only one of the questions is correct. Choose and mark the correct one.

Example 1. Choose the correct question.
A. Did Beth drive the tractor last week?
B. Is Beth drive the tractor last week?
C. Did Beth drove the tractor last week?
D. Drove Beth the tractor last week?

"A" is the correct question.
Did Beth drive the tractor last week?
Mark the correct letter, "A."

[✓ A.] Did Beth drive the tractor last week?
B. Is Beth drive the tractor last week?
C. Did Beth drove the tractor last week?
D. Drove Beth the tractor last week?

Example 2. Choose the correct question.
A. Does Jack looks sad today?
B. Do Jack looks sad today?
C. Does Jack look sad today?
D. Is Jack look sad today?

"C" is the correct question.
Does Jack look sad today?
Mark the correct letter, "C."

A. Does Jack looks sad today?
B. Do Jack looks sad today?
[✓ C.] Does Jack look sad today?
D. Is Jack look sad today?

BEGIN PART I. For each test item mark the question that you think is correct.

1. A. Jog you in the park every morning?
   B. Is you jog in the park every morning?
   C. Do you jog in the park every morning?
   D. Does you jog in the park every morning?

2. A. Is it rains in summer?
   B. Does it rain in summer?
   C. Does it rains in summer?
   D. Rains in summer?

3. A. Do Dad plant corn last spring?
   B. Dad plant corn last spring?
   C. Did Dad did plant corn last spring?
   D. Did Dad plant corn last spring?

4. A. Does your cat catch mice?
   B. Is your cat catches mice?
   C. Does your cat catches mice?
   D. Your cat catch mice?

5. A. Did watch you TV last night?
   B. You watched TV last night?
   C. Did you watch TV last night?
   D. You was watch TV last night?

6. A. Does you baked cookies every Christmas?
   B. Do you baked cookies every Christmas?
   C. Do bake you cookies every Christmas?
   D. Do you bake cookies every Christmas?

7. A. The plane crash in the mountains?
   B. Did the plane crash in the mountains?
   C. Was the plane crash in the mountains?
   D. Did the plane crashed in the mountains?

8. A. Do bloom flowers in spring?
   B. Bloom flowers in spring?
   C. Flowers bloom in spring?
   D. Do flowers bloom in spring?

9. A. Do you dream every night?
B. You dream every night?
C. You do dream every night?
D. Does you dream every night?

10. A. Did the cat climbed the tree?
B. The cat climbed the tree?
C. Did the cat climb the tree?
D. Did climb the cat the tree?

11. A. Does you wash your hair every day?
B. Do you wash your hair every day?
C. Do you washed your hair every day?
D. You wash your hair every day?

12. A. Do Dad burn the toast every morning?
B. Do burn Dad the toast every morning?
C. Is Dad burn the toast every morning?
D. Does Dad burn the toast every morning?

13. A. Did you sell your car last week?
B. Did you did sell your car last week?
C. Sell you your car last week?
D. You sell your car last week?

14. A. Do Becky read the daily paper?
B. Becky read the daily paper?
C. Does Becky read the daily paper?
D. Is Becky read the daily paper?

15. A. Are the girls play tennis at school?
B. Do the girls play tennis at school?
C. Do play the girls tennis at school?
D. Does the girls play tennis at school?

16. A. Does Jill go to the movies last night?
B. Jill go to the movies last night?
C. Did Jill go to the movies last night?
D. Did go Jill to the movies last night?

17. A. Do Americans do watch fireworks on July 4th?
B. Does Americans watch fireworks on July 4th?
C. Were Americans watch fireworks on July 4th?
D. Do Americans watch fireworks on July 4th?

18. A. We forget to do the dishes?
B. Did we forgot to do the dishes?
C. Did we forget to do the dishes?
D. Did forget we to do the dishes?

19. A. Does call Bob his parents on the TTY?
B. Bob calls his parents on the TTY?
C. Do Bob call his parents on the TTY?
D. Does Bob call his parents on the TTY?

20. A. Do you want to go swimming tomorrow?
B. Is you want to go swimming tomorrow?
C. Does you want to go swimming tomorrow?
D. Do want you to go swimming tomorrow?

21. A. Does Jack does play in the band?
B. Does Jack play in the band?
C. Is Jack plays in the band?
D. Does play Jack in the band?

22. A. Did Ted picked the apricots yesterday?
B. Was Ted pick the apricots yesterday?
C. Did Ted pick the apricots yesterday?
D. Ted picked the apricots yesterday?

23. A. Jeff ski at Heavenly?
B. Is Jeff ski at Heavenly?
C. Do Jeff ski at Heavenly?
D. Does Jeff ski at Heavenly?

24. A. Do meet you friends at the Mall?
B. Do you meet friends at the Mall?
C. Do you meets friends at the Mall?
D. Are you meet friends at the Mall?

25. A. Does Jean like butter on her popcorn?
B. Do Jean like butter on her popcorn?
C. Does like Jean butter on her popcorn?
D. Is Jean like butter on her popcorn?

END of PART I - Please Continue to Part II

Part II

Part II contains 10 very short paragraphs. First, read each paragraph. Then, write the question that fits the paragraph. Look at the next three examples to see what kind of questions you should write.

Example 1:
Lisa plans to bake an angel cake for Don's birthday. She hopes he likes angel cake.

Lisa asks Don, "____?"

Now, write the correct question on the blank line above.

The correct question is: **Do you like angel cake?**

- -

Example 2:
Ken is planning to take Barbie out to dinner. Ken would like to go to a Mexican restaurant, but he doesn't know if Barbie likes Mexican food.

Now, write the correct question on the blank line below.

Ken asks Barbie's sister, "____?"

The correct question is: **Does Barbie like Mexican food?**

- -

Example 3:
Yesterday there were a lot of flowers in the garden. Today there are only a few. Maybe someone picked the flowers last night.

Now, write the correct question on the blank line below.

I ask Mother, "____?"

The correct question is: **Did someone pick the flowers last night?**

BEGIN PART II. For each short paragraph, write the correct question on the blank line.

1. Dan and Debi want to invite Dick and Bess to go skating. Dan is not sure if Bess likes skating.

   Dan asks Dick, "____?"

2. Dave and Ben are very busy in their office. Dave is going to the cafeteria to get a hamburger for lunch. Ben often wants a hamburger too. Dave wonders if Ben wants a hamburger today.

   Dave asks Ben, "____?"

3. Kim can't do her math homework because she forgot to bring her math book home. She hopes her twin brother Karl brought his math book home.

   Kim asks Karl, "____?"

4. Jed is buying hotdogs for his wife Kara and her friend Jane. Jed doesn't know if Jane likes mustard on her hotdog.

Jed asks Kara, "____?"

5. Malia and her Mom like to go the ballet on Sunday afternoons. I don't know if they go the ballet every Sunday.

I ask Malia, "____?"

6. Sara's Dad promised to get her a surprise for getting all A's on her school report. Sara hopes Dad remembered.

Sara asks Dad, "____?"

7. Jamie has a new tennis racquet. He wonders if you want his old tennis racquet.

Jamie asks you, "____?"

8. Jeff wants to buy a Christmas present for his grandmother. He is thinking of getting Grandma a sweater, but he's not sure if she needs a sweater.

Jeff asks his Mom, "____?"

9. Yesterday there was a mild earthquake, but Pat didn't feel it. He wonders if his friend Joe felt the earthquake.

Pat asks Joe, "____?"

10. Kathy's new friend Eva is a vegetarian. Kathy wonders if vegetarians eat eggs.

Kathy asks Eva, "____?"

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END of TEST

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Thank you for participating in the Post-Test.

Name ______________________ Teacher ____________ Grade ___

Age _____ School ____________ Date ______________________

POST-TEST 2

Read the questions carefully. You should finish the test within the class period. If you finish early, please review your answers carefully.

Part I

Read each group of four (4) questions. Only one of the questions is correct. Choose and mark the correct one.

Example 1. Choose the correct question.
A. Did Anne drive the taxi last week?
B. Is Anne drive the taxi last week?
C. Did Anne drove the taxi last week?
D. Drove Anne the taxi last week?

"A" is the correct question.
Did Anne drive the taxi last week?
Mark the correct letter, "A."

[✓ A.] Did Anne drive the taxi last week?
B. Is Anne drive the taxi last week?
C. Did Anne drove the taxi last week?
D. Drove Anne the taxi last week?

Example 2. Choose the correct question.
A. Does Sam looks happy today?
B. Do Sam looks happy today?
C. Does Sam look happy today?
D. Is Sam look happy today?

"C" is the correct question.
Does Sam look happy today?
Mark the correct letter, "C."

A. Does Sam looks happy today?
B. Do Sam looks happy today?
[✓ C.] Does Sam look happy today?
D. Is Sam look happy today?

BEGIN PART I. For each test item mark the question that you think is correct.

1. A. Find you a job yesterday?
   B. You find a job yesterday?
   C. Did you find a job yesterday?
   D. Did you did find a job yesterday?

2. A. Does Julie write poetry in English class?
   B. Is Julie write poetry in English class?
   C. Do Julie write poetry in English class?
   D. Julie write poetry in English class?

3. A. Do buy the boys snacks at Safeway?
   B. Does the boys buy snacks at Safeway?
   C. Are the boys buy snacks at Safeway?
   D. Do the boys buy snacks at Safeway?

4. A. Did our team win the game yesterday?
   B. Did win our team the game yesterday?
   C. Does our team win the game yesterday?
   D. Did win our team the game yesterday?

5. A. Were sports stores have sales every month?
   B. Do sports stores have sales every month?
   C. Do sports stores do have sales every month?
   D. Does sports stores have sales every month?

6. A. Did you remember to bring your lunch?
   B. Did remember you to bring your lunch?
   C. You remember to bring your lunch?
   D. Did you remembered to bring your lunch?

7. A. Do Dad drive the car to work?
   B. Does Dad drive the car to work?
   C. Does drive Dad the car to work?
   D. Dad drives the car to work?

8. A. Does you have to clean the garage today?
   B. Do have you to clean the garage today?
   C. Do you have to clean the garage today?
   D. Is you have to clean the garage today?

9. A. Is your aunt work at IBM?
B. Does work your aunt at IBM?
C. Does your aunt does work at IBM?
D. Does your aunt work at IBM?

10. A. Did you water the plants yesterday?
B. You watered the plants yesterday?
C. Did you watered the plants yesterday?
D. Were you watered the plants yesterday?

11. A. Do Jill play on the baseball team?
B. Does Jill play on the baseball team?
C. Jill play on the baseball team?
D. Is Jill play on the baseball team?

12. A. Do you plays the trumpet in the band?
B. Are you play the trumpet in the band?
C. Do play you the trumpet in the band?
D. Do you play the trumpet in the band?

13. A. Does want Sue a new dress for her birthday?
B. Is Sue want a new dress for her birthday?
C. Does Sue want a new dress for her birthday?
D. Do Sue want a new dress for her birthday?

14. A. Do you swim in the lake every summer?
B. Does you swim in the lake every summer?
C. Swim you in the lake every summer?
D. Is you swim in the lake every summer?

15. A. Does it snows in Hawaii?
B. Snows in Hawaii?
C. Is it snows in Hawaii?
D. Does it snow in Hawaii?

16. A. Did Joe did paint the house last month?
B. Did Joe paint the house last month?
C. Do Joe paint the house last month?
D. Joe paint the house last month?

17. A. Does your friend writes stories?
B. Your friend write stories?
C. Does your friend write stories?
D. Is your friend writes stories?

18. A. Did bake you bread yesterday?
B. You baked bread yesterday?
C. Did you bake bread yesterday?
D. You was bake bread yesterday?

19. A. Do write you letters every evening?
B. Do you write letters every evening?
C. Does you wrote letters every evening?
D. Do you wrote letters every evening?

20. A. Was the car stall in traffic?
B. Did the car stalls in traffic?
C. The car stall in traffic?
D. Did the car stall in traffic?

21. A. The leaves fall in autumn?
B. Do the leaves fall in autumn?
C. Do fall the leaves in autumn?
D. Fall the leaves in autumn?

22. A. You do swim every weekend?
B. Does you swim every weekend?
C. Do you swim every weekend?
D. You swim every weekend?

23. A. Did the dog bury the bone?
B. Did bury the dog the bone?
C. Did the dog buried the bone?
D. The dog buried the bone?

24. A. Do you cook dinner every night?
B. You cook dinner every night?
C. Does you cook dinner every night?
D. Do you cook dinner every night?

25. A. Is Dad barbeque steak on Sundays?
B. Does Dad barbeque steak on Sundays?
C. Do Dad barbeque steak on Sundays?
D. Do barbeque Dad steak on Sundays?

END of PART I - Please Continue to Part II

Part II

Part II contains 10 very short paragraphs. First, read each paragraph. Then, write the question that fits the paragraph. Look at the next three examples to see what kind of questions you should write.

Example 1:
Bob plans to bake cookies for Beth's party. Bob hopes Beth likes chocolate chip cookies.

Bob asks Beth, "______________________________?"

Now, write the correct question on the blank line above.

The correct question is: **Do you like chocolate chip cookies?**

Example 2:
Eve is planning to take Bill out to lunch. Eve would like to go to a Chinese restaurant, but she doesn't know if Bill likes Chinese food.

Now, write the correct question on the blank line below.

Eve asks Bill's brother, "______________________________?"

The correct question is: **Does Bill like Chinese food?**

Example 3:
Yesterday there were many roses in the garden. Today there are only a few. Maybe someone picked the roses last night.

Now, write the correct question on the blank line below.

I ask Father, "______________________________?"

The correct question is: **Did someone pick the roses last night?**

BEGIN PART II. For each short paragraph, write the correct question on the blank line.

1. Ann was running in her first marathon. At the end of the race, she tripped and fell. Jeff was watching the marathon; he hoped Ann didn't hurt herself.

   Later, Jeff asked Ann, "______________________________?"

2. Jennifer's mom took her shopping for a new party dress. Jennifer hopes her boyfriend Rick likes the dress. When Rick comes to take Jennifer to the party,

   Jennifer asks Rick, "______________________________?"

3. Sam is going to visit Kim in the hospital and wants to bring some flowers. Sam isn't sure if Tony likes roses or carnations.

   Sam asks Kim's dad, "______________________________?"

4. Dad's car is broken. He took it to the mechanic to be fixed. Mother hopes the mechanic fixed the car right away. When Dad gets home,

   Mother asks Dad, "____?"

5. Gina hurt her knee in gym class last week. Today Peggy saw Gina walking very slowly. Peggy thinks Gina's knee still hurts.

   Peggy asks Gina, "____?"

6. Karen and Dave are going to a concert in San Jose. They have never gone there before, and Karen hopes Dave knows the way.

   Karen asks Dave, "____?"

7. Rita has a new history teacher, Mr. Jones. Rita thinks that Mr. Jones' hair looks funnny. Maybe he wears a wig.

   Rita asks a friend, "____?"

8. Alex and Tim were watching their favorite TV show. The TTY flashed and Alex answered it. Alex thought he missed an important part of the TV show.

   Alex asks Tim, "____?"

9. Eve and Fred are driving to Los Angeles. After driving for several hours, Eve wants to eat lunch. Eve hopes Fred wants to eat lunch.

   Eve asks Fred, "____?"

10. Beth and Paul are bringing snacks to their club meeting. Paul hopes Beth remembered to bring the potato chips.

    Paul asks Beth, "____?"

END of TEST

Thank you for participating in the Post-Test.

Name ______________________________ Teacher _____________ Grade ____

Age ______ School ________________ Date ____________________________

PRE-TEST

Part 1

Read each group of 4 questions. Only one question is correct. Mark the correct question.

Example 1. Choose the correct question.
A. Do you go to school every day?
B. Go you to school every day?
C. Does you go to school every day?
D. Is you go to school every day?

"A" is the correct question.
Do you go to school every day?
You mark the correct letter "A," as below.

A. Do you go to school every day?
B. Go you to school every day?
C. Does you go to school every day?
D. Is you go to school every day?

Example 2. Choose the correct question.
A. Does Sam looks happy today?
B. Do Sam looks happy today?
C. Does Sam look happy today?
D. Sam look happy today?

"C" is the correct question.
Does Sam look happy today?
Now, mark the correct letter "C," below.

A. Does Sam looks happy today?
B. Do Sam looks happy today?
C. Does Sam look happy today?
D. Sam look happy today?

BEGIN PART 1. Mark the correct question in each group.

1. A. Are you play ball at school?
B. Do play you ball at school?
C. Do you play ball at school?
D. Does you plays ball at school?

2. A. Does Grandma does like apple pie?
B. Do Grandma likes apple pie?
C. Does Grandma like apple pie?
D. Do like Grandma apple pie?

3. A. Do bears sleep in winter?
B. Do sleep bears in winter?
C. Sleep bears in winter?
D. Does bears sleeps in winter?

4. A. Did Jerry climbed the tree?
B. Jerry climbed the tree?
C. Did Jerry climb the tree?
D. Did climb Jerry the tree?

5. A. Is it rains in summer?
B. Does it rain in summer?
C. Does it rains in summer?
D. Rains in summer?

6. A. Your dog chase cats?
B. Does your dog chase cats?
C. Is your dog chases cats?
D. Does your dog chases cats?

7. A. Do you dream every night?
B. Do dream you every night?
C. Do you dreams every night?
D. Does you dream every night?

8. A. Did Ted picked apples yesterday?
B. Was Ted picked apples yesterday?
C. Did Ted pick apples yesterday?
D. Did Ted did pick apples yesterday?

9. A. Do Jill play baseball?
B. Does Jill play baseball?
C. Jill plays baseball?
D. Is Jill play baseball?

10. A. Does eat mice cheese?
B. Do mice eat cheese?
C. Do mice eats cheese?
D. Are mice eats cheese?

Please turn the page to Part 2

Part 2

Read the sentences and the questions.

Example 1: Bill wants to ask Joe and Sue to go bowling. Bill is not sure Sue likes bowling.

Bill asks Joe, **"Does Sue like bowling?"**

Now, write the question on the blank line below.

Bill asks Joe, "____?"

Example 2: Jill is having a birthday party on Saturday. She is inviting friends from school. Jill is not sure her friends know where she lives.

Jill asks her friends, **"Do you know where I live?"**

Now, write the question on the blank line below.

Jill asks her friends, "____?"

Example 3: Yesterday, Betty went to see the movie, "E.T." I wonder if she liked it?

I ask Betty, **"Did you like the movie?"**

Now, write the question on the blank line below.

I ask Betty, "____?"

BEGIN PART 2. For each group of sentences, write the correct question on the blank line.

1. Barbie is baking a chocolate cake for Ken. Barbie hopes Ken likes chocolate cake.

   Barbie asks Ken, "____?"

2. Jack fell off the jungle gym at school. Now Jack is rubbing his elbow. I think Jack's elbow hurts.

   I ask Jack, "____?"

3. Yesterday, there were lots of cookies in the cookie jar. Today, there is only one cookie. Maybe Dad ate the cookies.

   I ask Dad, "____?"

Thank you for taking the test.

Name ______________________________ Teacher _____________ Grade ____

Age ______ School ________________ Date ____________________________

POST-TEST

Part 1

Read each group of 4 questions. Only one question is correct. Mark the correct question.

Example 1. Choose the correct question.
A. Do you go to school every day?
B. Go you to school every day?
C. Does you go to school every day?
D. Is you go to school every day?

"A" is the correct question.
Do you go to school every day?
You mark the correct letter "A," as below.

A. Do you go to school every day?
B. Go you to school every day?
C. Does you go to school every day?
D. Is you go to school every day?

Example 2. Choose the correct question.
A. Does Sam looks happy today?
B. Do Sam looks happy today?
C. Does Sam look happy today?
D. Sam look happy today?

"C" is the correct question.
Does Sam look happy today?
Now, mark the correct letter "C," below.

A. Does Sam looks happy today?
B. Do Sam looks happy today?
C. Does Sam look happy today?
D. Sam look happy today?

BEGIN PART 1. Mark the correct question in each group.

1. A. Do you plays in the band?
B. Are you play in the band?
C. Do play you in the band?
D. Do you play in the band?

2. A. Do like your brother horses?
B. Do your brother likes horses?
C. Does your brother like horses?
D. Does your brother likes horses?

3. A. Does flowers grow in your garden?
B. Do flowers grow in your garden?
C. Do grow flowers in your garden?
D. Grow flowers in your garden?

4. A. Did jump the horse the fence?
B. Did the horse jumped the fence?
C. The horse jumped the fence?
D. Did the horse jump the fence?

5. A. Snows in January?
B. Is it snows in January?
C. Does it snow in January?
D. Does it snows in January?

6. A. Does your cat catch mice?
B. Is your cat catches mice?
C. Does your cat catches mice?
D. Your cat catch mice?

7. A. Do you watch TV after school?
B. Does you watches TV after school?
C. Do you watches TV after school?
D. Do watch you TV after school?

8. A. Dad planted corn yesterday?
B. Did Dad did plant corn yesterday?
C. Was Dad planted corn yesterday?
D. Did Dad plant corn yesterday?

9. A. Is Jack play the piano?
B. Do Jack plays the piano?
C. Jack plays the piano?
D. Does Jack play the piano?

10. A. Do you meets friends at the park?
B. Are you meet friends at the park?
C. Does meet you friends at the park?
D. Do you meet friends at the park?

Please turn the page to Part 2

Part 2

Read the sentences and the questions.

Example 1: Bill wants to ask Joe and Sue to go bowling. Bill is not sure Sue likes bowling.

Bill asks Joe, **"Does Sue like bowling?"**

Now, write the question on the blank line below.

Bill asks Joe, "____?"

- -

Example 2: Jill is having a birthday party on Saturday. She is inviting friends from school. Jill is not sure her friends know where she lives.

Jill asks her friends, **"Do you know where I live?"**

Now, write the question on the blank line below.

Jill asks her friends, "____?"

- -

Example 3: Yesterday, Betty went to see the movie, "E.T." I wonder if she liked it?

I ask Betty, **"Did you like the movie?"**

Now, write the question on the blank line below.

I ask Betty, "____?"

BEGIN PART 2. For each group of sentences, write the correct question on the blank line.

1. Jane fell off the swing in the park. Now Jane is rubbing her knee. I think Jane's knee hurts.

   I ask Jane, "____?"

2. Tom is baking chocolate chip cookies for Sally. Tom hopes Sally likes chocolate chip cookies.

   Tom asks Sally, "____?"

3. Yesterday, there were lots of roses in the garden. Today, there is only one rose. Maybe Mom picked the roses.

   I ask Mom, "____?"

……

Thank you for taking the test.

……

APPENDIX 6

"A Computer Approach to Teaching English Syntax Skills to Deaf Students"

Summary paper submitted for presentation at the 1990 AERA Conference

A Computer Approach to Teaching English Syntax to Deaf Students

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Perspective/Objectives

An effective comprehensive program of instruction for deaf students in basic English reading and writing skills has yet to be developed. To date, only 10% of the best 18 year-olds read at or above the eighth grade level, and the average deaf adult reaches only a fourth grade reading level. As a result, large numbers of deaf adults remain functionally illiterate (Quigley, 1984). The future of English instruction for the Deaf, however, holds more promise. The potential of computers to build highly visually-oriented materials, which capitalize on the visual-gestural grammar inherent in American Sign Language (ASL), can enable deaf students to acquire linguistic structures in English with the same facility that they experience in ASL (Fogel, 1988).

The objective of the research described here was to test the effectiveness of an instructional intervention to teach English syntax skills to the Deaf that (1) used the computer's special graphic capability to present concepts linked to the visual-gestural knowledge base of the Deaf, and (2) grounded the instructional design in a Direct Instruction approach (Becker & Engelmann, 1977).

Theoretical Framework

In order to design an effective instructional program, we needed to understand why the Deaf have difficulty understanding English, particularly syntax. First, we turned to the research in cognitive psychology and psycholinguistics which demonstrated that the Deaf rely on visual coding rather than auditory/speech coding (Conrad, 1973; Lichtenstein, 1983). Pointed toward techniques that were highly visual, we realized that we could capitalize upon the visual capacity of the computer to enable deaf students to learn those aspects of English syntax with which they have traditionally experienced difficulty in English but comprehend with ease in ASL.

Drawing on successful language research on the education of deaf persons (e.g., Iran-Nejad, 1981), we applied a Direct Instruction approach. Although the term "direct instruction" is associated with a small set of educational researchers, there is a surprising consensus among a wide range of instructional psychologists on a core set of design principles: the learner should

- have the prerequisite knowledge to use the instruction and to learn additional skills
- be motivated
- be guided through models which make clear when and how to apply new knowledge
- have ample opportunities to demonstrate their mastery of models in a context that makes errors likely, if the learners have not understood the new content well
- be able to benefit from corrective feedback

Techniques

Following the Direct Instruction model, we tested the learners over a range of grades (7-12) to determine at what ages what kinds of errors were made. Content analysis of errors with expert linguists identified the best target areas for syntax instruction and remediation, and helped define the population that had sufficient prerequisite English syntactic knowledge to be able to benefit from the intervention, but who lacked the ability to correctly build the structure to be taught.

Second, to engage and motivate the learners, we involved them as active participants in their instruction. Students were provided with multiple opportunities to build their own — often humorous — sentences, which were automatically illustrated by the program. (E.g. After a student chose the subject "elephant" from among six randomly selected choices, an elephant's head appeared. If the student chose the verb "ski," the picture changed to an elephant skiing.)

To guide learners through visual syntactic models, animated graphics picturing the transformation of sentences to questions preceded multiple practice opportunities for each syntactic structure taught. Unlike most computer-assisted-instruction (CAI), this program did not limit learners to making simple choices among a small set of "right answers"; such an approach would not have satisfied the above principles of direct instruction (Engelmann & Carnine, 1982). Instead, learners were able to build their own questions from a variety of separate words and phrases. Prior analysis of error patterns for these constructs were used to ensure that the words and phrases present would allow learners to make mistakes.

Finally, learners benefited from detailed, corrective feedback for common errors (about 20 per structure). Provision to review structural modeling was built into the program for instances when the specific, informative feedback was insufficient to correct understandings. However, the immediate feedback proved so effective that none of the 35 subjects ever triggered the more detailed modeling reviews. The success of the feedback can probably be attributed to its visualization; the instructional program used video "effects" such as flashing, highlighting, and reverse video to emphasize instructional points. In addition, for each error a short English message responded to the likely misunderstanding that led to the wrong structure; all textual messages were linguistically controlled.

Methods

The intervention was tested using a classical hypothetico-deductive model. The null hypothesis, that CAI designed to teach English syntax to deaf high school students would have no effect on their actual rate of acquisition of syntactic knowledge, was posed and rejected.

Based on English syntactic ability and reading comprehension, subjects in a matched pair were randomly assigned to either a treatment or a control group. As shown in Figure 1, the study consisted of two interventions. Prior to the first intervention, both treatment and control groups were administered Test 1, a pencil and paper pre-test composed of 25 multiple choice questions modeled on the Test of Syntactic Abilities (Quigley, 1978). The treatment group (A) completed the three lessons in the CAI Syntax program in two to three class periods. To eliminate the possibility of a Hawthorne effect, the control group (B) used an alternate computer program in an unrelated subject area for the same period of time. Within one day after this first CAI intervention, Test 2 was administered to both groups. Two weeks later, Group A used the alternate computer program and Group B used the CAI Syntax program. The next day Test 3 was administered. The format, level, and administration of Tests 1, 2 and 3 were comparable; the syntactical structures in each of the test items were identical, but the nouns and verbs were different. The internal consistency of the three tests were assessed using the Kuder-Richardson 20; the reliability coefficients were uniformly high, ranging between .73 and .80.

Data Source

The sample consisted of 18 treatment and 17 control subjects, ages 14 to 18, from a high school program at a residential school for the Deaf. To facilitate data analysis, the program contained a database to permit easy input and access to the subjects' responses to the syntax practice in the treatments, as well as to the time on task. Although the controlled experiment represented a rigorous way to assess the value of the CAI intervention, in our experience observations are inexpensive additional sources of insight regarding CAI-based treatments. During the interventions, trained observers collected data on the subjects' visible responses to the instructional materials. Of particular interest were the non-verbal signals that learners were, or were not, responding in a manner that indicated alertness, attention, and positive affect.

Results

The data shown in Figures 2 and 3 clearly demonstrated the effectiveness of the intervention. Statistically significant gains in syntax knowledge were made by each group receiving the CAI-Syntax intervention. In contrast, the control group made no significant gains in each phase. The means for Group A rose from 65.11 to 75.78 ($p < 0.049$) and from 69.30 to 85.88 ($p < 0.0001$) for Group B. In contrast, Group B demonstrated no significant gains ($p < 0.37$) with the alternate CAI from Test 1 to 2. Interestingly, when Group A was tested two weeks after the CAI-Syntax treatment, they retained most of the syntax knowledge they had acquired earlier; the mean for Test 3 dropped to only 75.06, from 75.78. In our experience, these improvements in syntax knowledge are extraordinary given the brief duration of the treatments.

Conclusions: Educational importance of the study

It is a difficult, complex, and time-consuming task to effect a change in language behavior that has become ingrained. As evidenced by the statistically significant results of our test of the intervention, it appears that the CAI approach described above has substantial potential for accelerating the acquisition of English syntactical knowledge by the Deaf. The fact that such meaningful improvement could be obtained in an area where failure is the norm should not be overlooked, especially for an intervention of only two to three class periods (90 to 135 minutes).

Although the instructional intervention focused on yes-no question formation, the effectiveness of this approach suggests the desirability of building a complete CAI syntax curriculum based on visualization techniques as linguistic bridges from ASL to English syntactic structures. Visualization and simultaneity of expression in well designed CAI may be particularly important to basic concepts in the education of the Deaf; these aspects can build on certain strengths of the Deaf that are not utilized in standard teaching materials -- those that are visual and spatial like ASL, rather than linear and sequential like English.

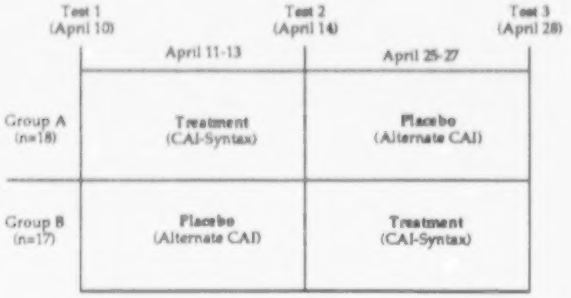
Test 1 (April 10)
Test 2 (April 14)
Test 3 (April 28)
April 11-13
April 25-27
Group A (n=18)
Treatment (CAI-Syntax)
Placebo (Alternate CAI)
Group B (n=17)
Placebo (Alternate CAI)
Treatment (CAI-Syntax)

Figure 1. Schematic Diagram of the Experimental Design

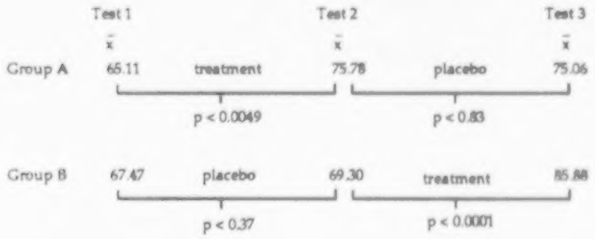
Test 1
Test 2
Test 3
x̄
x̄
x̄
Group A
65.11
treatment
75.78
placebo
75.06
p < 0.0049
p < 0.83
Group B
67.47
placebo
69.30
treatment
85.88
p < 0.37
p < 0.0001

Figure 2. Means of Group Scores on Pre-Post Tests of Syntax Skills (Measured by multiple forms modeled on S. Quigley's TSA)

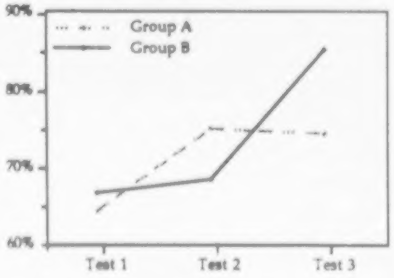

Figure 3. Effects of CAI Instruction and Alternate (Placebo) CAI

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